JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Testing and Rating.

IT must be a matter of considerable satisfaction to those who have followed the work of the Gas Companies' Protection Association to find, from the report of the proceedings at the annual meeting published last week, that the organization is stronger than ever, and is going from one good piece of work to another with increased energy. A Committee is a strong one in initiative and propelling force that can claim among its number such a trio as Sir George Livesey, Mr. Corbet Woodall, and Mr. H. E. Jones; and that the Committee of the Association can now fortunately do. There has not been any lack of evidence of the capacity of the Association for accomplishing excellent work for the gas industry; and we would that support more commensurate with the value of the work were accorded. The importance of their labours is undeniable, though supplementary to those of the London Gas Companies, in assisting to erase from the Statute books that absurdity of the chemical extremists—the compulsory removal of sulphur compounds other than sulphuretted hydrogen. Now references have been made to Committees to consider the desirability of the Association taking the lead in promoting Bills with the object of bringing about, in the United Kingdom, the universal application of the Carpenter "Metropolitan" No. 2 burner, and to secure reform in the rating of gas undertakings. These are both matters which will incite little dissension from the midst of the gas industry.

Uniformity of testing for illuminating power is an object the desirability of attaining which has been urged in these columns on every possible occasion, and only as recently as in our issue of Oct. 1. The arguments then adduced could with propriety, if it would serve any useful purpose, be reprinted as relevant to the resolution passed at the meeting of the Association at the instance of Mr. Charles E. Botley, seconded by Sir George Livesey. The Bill that it is proposed should be promoted would commend itself far and wide in the gas industry; but, of course, it would have to secure the approval of the Board of Trade. We cannot think that there would be any difficulty about that. The new model testing clause, the action of Parliament last session in unifying clauses in gas measures referring to testing for illuminating power, and the decision of the Board of Trade in the Southport case, all give strong hope that the movement of the Association would be countenanced by the Board. All the Association are contemplating is that what is now being done piecemeal session by session, shall be brought to pass at one stroke; and that is a sensible proposition. The Association, however, are under a disability in this matter. It can only be claimed that its representation extends to those companies who are members; and the first question the Association would have to be prepared to answer to the Board of Trade would be, "By what right or "by what authority do you act in this matter." The Association would, therefore, go to the Board strong in right and authority if they had in their possession a petition signed by a great majority of the responsible heads of the gas undertakings of the kingdom, both company and local authority. The adhesion of the latter to the movement would be especially valuable in repelling the opposition that would certainly be provoked here and there where companies are the gas suppliers. But, so far as such hostility is concerned, it will be encouraging to remember the Removal of Sulphur Restrictions Bills.

The suggested attempt to remedy the chaotic condition to which the rating of gas undertakings, through the mutations of time, has been brought, is even a larger question; seeing that it means the overhauling of the system of rating —if "system" it can be called in which the forms of procedure are anything but systematic—from its base upwards. The whole matter is, as recent happenings have shown, one of great moment to the industry; and, after what has occurred in the South Metropolitan case, no more time than is necessary should be lost in making a move. Promises have been made by the Government that the entire question of rating shall be investigated; but no general revision of rating legislation, without special provision for the peculiarities of gas undertakings, would or could do justice to them. A fair and cogent case can be made out for special consideration being given to them. However, it is significant of a forcible prosecution of this matter, if the Association determines to take it up, that the resolution referring the question to a Committee for deliberation was moved by Sir George Livesey, and seconded by Mr. Corbet Woodall. This identification with the matter, at the very inception of the movement, of the heads of the two leading Metropolitan Gas Companies is of great importance; and the initial action they have taken cannot fail—the question of rating is too serious—to appeal to all administrators of gas undertakings from the Gaslight and Coke Company downwards. As in the case of the test-burner, any measure that may be promoted to reform the system of rating as applied to gas-works would have to be taken up by a Government Department; and as in the case of the burner, too, so in this question of rating the hope is not entertained that realization of desire would be secured the first time of asking. But we have had in recent sessions many instances of the consummation of hope, through perseverance, both in the gas industry and in matters of more general consequence. The precedents are encouraging to the commencement and continuance of action in respect both to test-burner and rating. So far as the Gas-Works Clauses Acts are concerned, the General Committee of the Association have not thought it advisable to promote an amending Bill; but the question is not yet dead in other quarters. The intimation the Council of the Institution of Gas Engineers received, that revision would necessitate both give and take, was insufficient to justify any final shelving of the question. Some knowledge as to what would have to be yielded and what would be the reward is required, if there are any means of obtaining it.

Local Authorities and the Gas-Fittings Business.

THE promise that the Lord Chairman made, in the Upper House last session, that provisions governing the supply of appliances and the fitting-up of houses by local authorities for electricity service should be considered, and dealt with in the Model Clauses, has been more than redeemed; for the new clauses dealing with this matter that appear in the recently-issued edition of "Model Bills and Clauses" apply not only to electricity supply but to gas and water. Happy, therefore, will be those municipal gas authorities who have already specific powers to supply gas cookers, fires, and fittings to, and execute work in, the houses of consumers without the intervention of a contractor, and without any other restricting conditions. Henceforth any request for such powers will have to be shaped after the model clauses; and those authorities who have been providing fittings and labour in fitting-up houses without specific powers, and have been dispensing with the services of local contractors, will no doubt find these tradesmen a little more keen, in view of these model clauses, in bringing such authorities to what they conceive to be their proper bearings. But model clauses do not constitute law; and, while admitting that the model clauses have strengthened the position of local contractors as far as the future goes, there is nothing in them that can effectually be used to coerce those gas authorities that, without specific authority in their Acts, are engaged in the provision of fittings and the fitting-up of houses.

The first of the new addenda to the old "Power to Supply "Fittings" model clause says that "it shall not be lawful for "the corporation [or other local body] to expend money "(except through a contractor) upon the provision of such

" fittings, or of labour and materials required for the fixing, " repairing, or removal thereof, upon or from the premises " of their consumers or prospective consumers." The provision is, of course, directed to the prospective prevention of municipal competition with local trade; and professed anti-municipal traders as we are, we cannot complain of the provision, excepting from the points of view that, in the case of gas supply, nothing should be done, in the houses of the working class and poor, to lessen in any way the direct supervision and responsibility of the gas supplier, that the work going through a contractor's hands, may increase the charges that have to be made upon the consumer, and that, in connection with gas supply, the local contractors in most towns have not deserved well at the hands of the gas departments, for the negligence of the former was the real impellent to activity in this work on the part of the latter. There is another point that should not be lost sight of in connection with this spirited conduct of the fitting-up business, to the public advantage, on the part of local gas-supplying authorities; and it is that what has been done has never possessed the same element of speculation that the similar business has done in connection with electricity supply, as has been proved by the deficiencies shown where separate and proper accounts have been kept by electricity departments for this branch of their business. To ordinary gas consumers rental is always charged for the means supplied to them for utilizing gas; and the prepayment system has ever been conducted with, to meet the expenses incurred, a good margin over and above the ordinary charge for gas.

Local authorities who may have these new provisions applied to them will have—and very properly—to adjust the charges to be made by them for fittings (gas or electricity), so that all expenses connected with them, including interest and sinking fund, are met from those charges. It is also proposed that charges shall be stated on the demand notes delivered to the consumers; and further that separate accounts of the fittings business are to be kept, so as to give assurance that the business is conducted on paying lines. May it not be that occasionally the model prepayment clauses, limiting excess charges, may clash with these new provisions as to the supply of gas-fittings?

The Report on the Road-Tarring Trials.

EXTENSIVE welcome will be accorded the report of the Judges in the tar-spreading competition that took place at Staines at the beginning of the past summer. Representing the Royal Automobile Club and the Motor Union of Great Britain and Ireland, the Roads Improvement Association, who inaugurated the trials, are worthy of the highest commendation for having taken action in a form which, we are hopeful, will give considerable impetus to the betterment of roadways and to the protection of the public against the annoying and destructive nuisance to which they have become subject since motor cars have entered into possession of highways and by-ways alike. The present report, however, cannot be accepted as the final word on the question with which it deals; for on several issues it is really about as inconclusive as a report could be. The utmost that can be said for it (apart from its value as an incentive to road authorities) is that the trials have enabled the capable adjudicators to commence to weed out the bad from the good aspirants for favour in this particular direction.

That the report is inconclusive is not the fault of the Judges; circumstances governed their scope. For instance, the weather during the past summer has been the antithesis of that which raised from the public a deep growl in 1906 over the torments suffered from the dust trouble when a continuous run of dry and high-temperature months produced the worst possible conditions on our roadways. There have only been intervals during the summer just past when the roadways reached anything approaching the objectionable state of the preceding summer. And with frequent rains and an almost continuous humid atmosphere, the roads were not in the best condition for really effective trials of either machines or tar and the preparations in which tar is the predominating substance. Then, again, some of the spreading and spraying machines entered for the competition were still in the inchoative stage; and it is only fair to say that two or three of those that did not gain the distinction of a prize and medal are exceedingly promising in both design and method. But the Judges had, of course, to deal with development and performance at the time of the trials—possibilities could not be taken into account in their adjudication. Further, with regard to the tar preparations, and the dissimilar experiences with tar from different gas-works, there is instructive explanation yet to be drawn as to the causes producing the varying suitability. We understand that the Roads Improvement Association are now preparing a further report which will deal fully with the whole question of the use of tar for road purposes; and this will be issued early in the spring. It is too much to hope, however, that this supplementary report will treat of the point last raised; and therefore it may be suggested that it should be the subject of gas-expert investigation. The point appears to be the simple one, Why is Reading tar "far " inferior" for road purposes to that supplied by the South Metropolitan Company, and why did it contain " a great " deal of foreign matter, which blocked the nozzles of the " machines, and caused very irregular working?" The various points raised both in respect of machines and tar constitute our reasons for regarding the report as technically inconclusive; but we repeat that no blame for this can lie at the doors of the Judges.

The report, however, is not altogether destitute of valuable findings; and it will without doubt have great influence with road authorities. On this head, we cannot help congratulating those who have won, through the trials, the topmost approval of the Judges, as signified by the awards; for that approval means business. Nevertheless, we cannot help feeling some sympathy for the unsuccessful competitors; for the trials have made it the more difficult for them, should their machines and preparations eventually realize substantial improvement, to dislodge those who have gained the places of distinction in the present trials. Touching, however, the valuable points in the report. In the work of tar-surfacing roads, hand labour has been completely routed, both in point of cost and resulting work, by the tar-spraying machines; and crude tar and tar preparations have entirely beaten from the field those compounds in which tar is absent or in which it only forms a small part. After application, from a week to a month was ample time for annihilating the efficacy of the latter. Those are the Judges' two leading findings, both of which bring to the front other suggestive matters. Concerning machine work, the rapidity with which it is done and the mechanical construction are not, to the road authority, of such great importance as the results of the spraying or spreading and operating costs. For example, one of the machines that did not get a prize or a medal is voted a cumbrous contrivance; but it gives a heavier and far more durable coating than any of its competitors. While another machine—that designed by Mr. Reeson—which was not entered for competition, did, in the Judges' opinion, very satisfactory work, and has been favourably commented upon. Therefore, although certain machines have secured prizes and medals, they must not be taken as comprising the alpha and omega of mechanical spraying, but only as being the best developed at the time of the trials. However, the prize machines have justified their claim to superiority over hand labour; and they have proved that the cost of laying a single coat of tar can be brought down to $\frac{1}{50}$d. per superficial yard, or approximately £1 per mile of road, six yards wide, excluding, of course, the cost of the tar.

Passing from the mechanical application to the material applied. As has been said, the trials have proved tar to be the incomparable substance for use; but there are several points yet to be solved before agreeing that the trials have finally settled the question of tar *versus* a tar preparation. The winning composition was " Clare's patent tar Compo." One gallon of this preparation is capable of covering seven square yards of road surface, applied in two coats; and the cost is 3½d. per gallon. This—at per gallon—is dear in comparison with ordinary coal tar; but the Judges remark that crude coal tar does not yield satisfactory results unless applied in quantity in excess of that found necessary in the case of the patent compo. But what is that excess? Another sentence puts it that quite " one-and-a-half times " the quantity of tar is required to give equal results. If " equal results " can be obtained with one-and-a-half times the quantity of tar, then we submit that it may be cheaper to use tar than the patent tar compo. at 3½d. per gallon. The crude coal tar used in the trials was mainly supplied by the South Metropolitan and the Reading Gas Companies; but the report, as previously mentioned, points to a variation in the degree of suitability of the tar. It will, however, be a satisfaction to learn that gas-works tar is preferable to blast-furnace tar; so that this disposes of another competitor for this new purpose. A further peculiar variation in suitability arises between the refined tar of

the South Metropolitan Gas Company and that supplied by Messrs. Burt, Boulton, and Haywood; that of the Gas Company being superior to that of the firm. The experiences of gas engineers do not harmonize as to the use on roadways of oil-gas tar; and the Judges find, from trial with oil-gas tar entered by the Gaslight and Coke Company, that, while it probably penetrates deeper than anything else, it does not form so durable a wearing surface, and consequently is not so efficient a protector as a good tar preparation. However, there is a field of utility for it as a first coating, to be followed by a second coating of coal-gas tar or other similar substance.

These are among the many points of the report, the issue of which we hope will stimulate road authorities to greater action, in connection with the protection of roads, persons, and property, by the tar-surfacing of the roads. Further progress has been made in the matter of application this year; but the incitant provided by such weather as was experienced in 1906 was—unfortunately for gas-works and the happiness of the public—absent.

Precedents for Exhibition Financing.

THE editorial article in the "JOURNAL" last week on the financing of gas exhibitions by the gas industry reminds us of two precedents that are worthy of imitation, and those precedents are particularly applicable to the Franco-British Exhibition, seeing that they are both drawn from France. Memory goes back to the Universal Exposition of Paris in 1889, in which exhibition the gas industry of France was represented by a handsome pavilion in a conspicuous position. That pavilion was built and its site paid for from a fund collected by the Committee—having at its head the then President of the Société Technique, M. Albert Ellissen—who took the matter in hand. On that occasion, the Paris Gas Company figured in the list of subscribers for 80,000 frs., and other Gas Companies—among them the Imperial Continental Gas Association and the European and Continental Union Gas Companies—for 10,000 frs. each. Coming down to the International Exhibition in Paris in 1900, a fund for the Gas Pavilion was raised, which, by the end of 1899, reached the round total of 265,000 frs. (£10,600). In this case the Compagnie Centrale du Gaz headed the list with 30,000 frs.; and the Paris Gas Company followed them with 20,000 frs. From this material evidence, it is patent the gas companies of France recognize their obligations in the matter of financing when there is demonstrating to be done for the behoof of their industry. The British gas industry cannot point to any corresponding munificence on account of exhibitions; but in due time we shall learn whether the managements of those gas undertakings represented on the Franco-British Gas Section Committee, and those gas administrations who may be friendlily inclined towards the scheme, will accept as precedents worthy to be followed those we have extracted from the annals of the French gas industry. As Mr. J. W. Helps said at Manchester, we must "find some "means of stirring up gas shareholders and those respon-"sible for the direction of gas undertakings to the fact that "they must not expect exhibitors to go to all the expense of "making these displays." The sole intention of this reference is to assist in that stirring up. Be it remembered that, after Earl's Court, the gas plant and appliance manufacturers decided that they could not frequently go to such expense as they then incurred; and their views have clearly hardened since then.

Fallen Among Thieves.

ONE does not know whether to sympathize with the shareholders of the West Suburban Gas Company, of which the microscopic Colnbrook Gas-Works were the nucleus, for the loss of the major part of their invested money, or for being deficient in what is known as gumption, as is evidenced by their having sunk money in a concern of which they knew nothing, and which was promoted by men to whom the epithets of rogues, thieves, and swindlers are freely applied. If the Uxbridge Gas Company have done no other good to the gas industry by the purchase of this Company, stamping out the existence of the concern, and ending the troubles of the shareholders, the Chairman (Mr. H. E. Jones) and the Directors have done an invaluable service in making that purchase the subject of arbitration, and dragging out before the Umpire (Mr. Corbet Woodall) and the Arbitrators (Mr. E. Herbert Stevenson and Mr. Horsey) the whole lugubrious tale of this swindle—which is only one of a number practised on the public within the last three or four years. In addition to the exposure, one excellent result of the arbitration proceedings will be that the Liquidator will, as it is his duty to do, lay the whole of the facts before the Public Prosecutor; and if Messrs. Darby and Gyde, known as Messrs. Darby and Co., otherwise Messrs. Lawson and Co., do not show a clean pair of heels, we, among others, hope to have the felicity of seeing them attempting to justify themselves in a Court of Law, and then (if they cannot) witnessing their departure to a place where promotions will cease to trouble, and where they will have time to meditate upon the stupidity of their deeds. These men were also the prime promoters of the notorious Kent County Gas Company swindle, the Goudhurst works of which Company have just been sold by auction for £1250, after having been sold to the Company by Darby and Gyde for £21,800—£21,800 for what had cost them £2350, *plus* £90 expended on the plant! Gyde, as another report shows, is just now passing through the Bankruptcy Court; but where all his ill-gotten gains from Gas Company promotions have gone, is a matter upon which there is no information. We trust that these sequels to fraudulent gas flotations are but the precursors of others, as nothing would give greater pleasure in the gas industry than to see the whole of those who have been engaged in them receive their well-merited deserts, and this latter-day plague of the gas industry effectually wiped out. The tale of the West Suburban swindle (as told in the arbitration proceedings) will be found reported on p. 433, and references to the bankruptcy of Gyde and the sale of the Goudhurst works appear on p. 435.

Just look for a moment at one or two points brought out in the arbitration proceedings to determine the price to be paid to the West Suburban Company by the Uxbridge Company. The actual price paid by Darby and Co. for the Colnbrook works was £500. The amount paid to Darby and Co. for the works by the Company they promoted was £11,750; and the vendors took good care to receive the whole purchase price in cash, and not in shares. Such unprincipled Company promoters prefer to handle cash, and then to leave their victims (as they did in this case) to wrestle as best they can with the dilemma in which they are placed by trickery and their own folly. The Company have, in addition to this £11,750, since paid away nearly £3000; the greater part being on account of contracts for new plant. It was the Company—a Company of foolish and deluded people—and not the promoters of the Company, who were represented by those who framed a case making out a value of £6200 as the proper sum to be paid by the Uxbridge Company for an undertaking making a loss and only supplying 700,000 cubic feet of gas per annum. But carefully as the case was supported by Mr. Freeman, K.C., and Mr. Charles Hunt and Mr. R. Bruce Anderson, the facts elicited in cross-examination by Mr. Hutchinson caused it to break down entirely (before the evidence was heard of Mr. Frank Jones and Mr. Arthur Valon for the Uxbridge Company); and the advisers of the selling Company gladly accepted the sealed offer of the purchasing Company, amounting to £1808. When our readers peruse Mr. Hunt's evidence as to the microscopic character of the existing plant—a plant of about sufficient size to make a decent coal-testing or experimental works—and the facts brought out as to how a list of requisitions for gas was constituted, there will be agreement with the expression of the Umpire's opinion that "the settlement was "not an unfavourable one" to the West Suburban Company, and especially so when the generous action of the Uxbridge Company's Directors in regard to costs is taken into account. The actual value of the concern was no doubt much less than the offer. But the district has a certain special value to the Uxbridge Company; and therefore they were anxious to deal as liberally as consideration for their own interests would allow with the shareholders of the West Suburban Company. The Umpire and Arbitrators also felt that the Uxbridge Gas Company had done their duty in bringing the case into Court rather than settle it; and so will say all who are desirous of seeing the end of these carefully prepared but gross swindles.

Lectures at the Manchester Exhibition—Lighting.

The popular lectures at the Manchester Exhibition have been a source of much attraction, and so it was intended they should be. Some of the lectures have been a little more prosy than

others; but that has been the fault of the subject rather than of the man. Of course, there has been nothing much in them that can be called fresh for technicians; but it should never be forgotten by technicians that what is common knowledge to them is perhaps altogether strange and unappreciated by next-door neighbours. We congratulate the lecturers on having recognized this to the full, and on having been able to put themselves (so to speak) in the consumers' shoes, and talk to them on the subjects of lighting, heating and cooking, gas hygiene and ventilation, the industrial uses of gas, and the smoke problem from their own ground. The consumer who has listened cannot now plead ignorance as to the, for him, economic possibilities of gas; nor can he declare that no one has been interested in telling him of those few simple rules that will enable him, without outside help, to maintain his burners in a high state of illuminating efficiency. He has had dispersed from his mind those hoary fallacies of the flat-flame burner *régime* (fallacies resurrected for use by those present-day claimants to scientific culture the electricians) regarding the polluting effect on the air of rooms of burning gas; and he has been shown how, on the contrary, by the simplest provision of ventilation the incandescent gas-burner is one of the best air-renewing agents known for any room. The consumer has been informed, too, of the relative costs of incandescent gas lighting and electricity.

Heating, Cooking, &c.—The Price of Gas for Heating.

The consumer has likewise had his attention directed to the advantages of heating and cooking by gas. The vices of the domestic coal grate have been deservedly painted before him in the blackest of colours. It wastes, it soils, and it contaminates; and there will be placed on record a further advance in civilization when the domestic coal grate is dethroned and the gas-fire reigns supreme. Professor Cohen says that we are not going to reach the ideal form of heating with "Coalite" or other solid fuel; so the ideal is the gas-fire. Mr. Clayton bears this out; for, without equivocation or qualification, he asserts that the domestic fire of the future "will be" a gas-fire. The speed in reform in our heating arrangements will, the lecturers are in unison in asserting, be determined largely by the price of gas. The action of municipalities in taking money from the gas profits for the relief of rates when a large amount of the money spent from the rates could be saved by encouraging the adoption of gaseous fuel has been roundly condemned. It is easy to agree with Mr. J. W. Graham, M.A., that the man who uses gas instead of coal is a public benefactor; and to look kindly on his remark that "there is sound reason for supplying such a man with gas at even a little below cost." But he does not advocate such an extreme course for immediate application in encouraging the "public benefactor." As a beginning, he suggests that, in the case of municipal undertakings, the amount paid per 1000 cubic feet in rates and in contributions to the relief of the rates should be taken off the price of all gas used for heating purposes. If this were done in the case of Manchester, gas could at once be supplied for heating purposes at 1s. 9d. per 1000 cubic feet, instead of the ordinary price of 2s. 3d. The obstacles in the way of the application of the practical suggestion are the misgovernors who prefer profits to purity. During the lectures those interested in industry heard about the gas-engine, and of its pre-eminence in economy among heat-motors; and the many uses of gas in manufacture of all kinds were also matters of interesting reference.

How to Develop the Power Load.

Periodically the electrical press gets an attack of what has been aptly termed "publicitis;" and men are written up as heroes for their supposed great doings in the commercial department, and ordinary business methods are lauded as something unique. In the "Electrical Review," the high pitch of development to which the business side of the Marylebone Electricity Department has attained has been sketched, and the article accorded a prominent place. *Inter alia*, we learn from it that, with a view to educating users of gas-engines in the correct method of determining their power costs, a special folding card has recently been issued, scheduling on one side the items which go to make up the "true cost" of gas-engine operation, and on the other, similar items for the electric motor. Gas-engine users are "encouraged" to fill in the cost against each item detailed; and the department then fills in the other side—"thus obtaining what is usually so difficult to arrive at, a correct comparison." It is not gathered from the article that, though the comparison may be a "correct" one, the department guarantees that the costs for an equivalent amount of work shall not be exceeded, nor that an uninterrupted supply of current will be guaranteed. But beyond this special folding card, we see that a system has also been recently introduced by aid of which it is hoped in time to obtain an accurate knowledge of every gas or steam engine plant in the borough. Such data admittedly would be of considerable value in developing the power load, since, if obtained, it would enable each instance to be thoroughly studied, and the necessary estimates prepared with more care than can be done at short notice. The collection of this information is part of every assistant's work; and when reported it is analyzed and recorded in a special file. It may be imagined that, even in St. Marylebone, there are power users who would object to this "nosing" round on the part of the Electricity Department. Still where the information can be secured, it must be of value. *Ergo*, the Gas Company might return this attention of the Electricity Department to gas-engine users, by also supplying them and electricity power users with a special folding card, and by sending capable men to spy out the electrical power land.

How Not to Develop Business.

In publicity work in connection with such large undertakings as those dealing in gas and electricity, it is necessary to have an educated man at the head, in order that the efforts—literary or otherwise—to develop business may not bring the undertaking into ridicule. The "chief" engineer of a corporation electricity undertaking is responsible for addressing to a manager of a public house the letter from which the following is extracted: "The many advantages of electric light are no doubt known to you, but have you realized how much more attractive an installation would make your business premises? The *coolness* in the *hot summer evenings* —impossible with any other method of lighting—will gain the immediate appreciation of your present customers, and many new ones also. The freshness of the atmosphere thereby ensured, prevents that feeling of stupor often seen in people coming suddenly from a stifling atmosphere into the fresh air outside—*an effect which is so often mistaken as being due to intoxicants. In this way, electric light would be of the greatest assistance in maintaining unsullied the good reputation of your house.*" The letter has been characterized as "either ignorant, or foolish, or insolent." In our opinion, it is all three; and the sooner that "chief" electrical engineer studies composition, and tries to develop the inestimable blessing of common sense, the better will it be for the undertaking he was appointed to serve. Perhaps his excuse is that he was suffering from a feeling of stupor after sitting in a stifling atmosphere—we will not be so rude as to suggest of a public-house bar.

Are Gas-Engines Fixtures?

The report in our "Legal Intelligence" of a case which occupied Justices Phillimore and Walton in a Divisional Court last Wednesday will be interesting to all who let on hire or employ gas-engines. It was an appeal by Messrs. Crossley Bros. against a decision of Judge Smyly, in the Shoreditch County Court, in a matter which came before him some months ago. The firm named had let a gas-engine to a Mr. Jones, the tenant of certain premises, who sublet them. On the rent falling into arrear, the owner of the premises distrained, among the things taken being a gas-engine, which was sold by auction. The point in dispute was whether the landlord had a legal right to do this; and the settlement of the question was subject to the answer to be given to another—viz., whether or not the engine was a "fixture." In the County Court, his Honour was guided by the decision in the old case of *Hellawell v. Eastwood*, in which it was held that machinery fixed in a similar way to that adopted in the present instance had never become part of the freehold, and was consequently distrainable; and he gave judgment for the landlord. Thereupon Messrs. Crossley, who had taken the proceedings, appealed. In the Higher Court, it was submitted on their behalf that the case relied upon had not been followed for many years, and had been the subject of many animadversions. Their Lordships came to the conclusion that the decision in the more recent case of *Hobson v. Gorringe*, in which it was decided that a gas-engine was a chattel fixed to the freehold and a part of it

(subject always to the power of severance), was the one they ought to follow; and therefore they reversed the judgment of the Court below. Leave to appeal was, however, given; so that more will doubtless be heard of the case, the point at issue in which is of much importance.

The Task of the Engineer.

That if civilization is not to break down under its own burdens, engineers will have to exert themselves in the future even more strenuously than in the past, is the conclusion arrived at by Mr. John Adamson, the President of the Manchester Association of Engineers, who, in the course of his Presidential Address delivered a few days ago, gave his reasons for this belief. He pointed out that engineers had been intimately connected with the progress of what was termed "civilization," and urged that further advances in the way of improving the effect of man's labour would depend on individual efforts, and not on those of the community. If, he said, a community made a mistake, the tendency was for the results to be perpetuated; while if an individual made a mistake, he was either spurred to better efforts or he succumbed and his losses were his own. The meeting of failure on the path to success in the case of the individual was one of the points brought out by Mr. Thomas Newbigging last Saturday, in the course of the address of welcome he delivered to the members of the English Junior Gas Associations, who foregathered at the Gas Exhibition. This address, as well as the other proceedings at the meeting, will be found reported in another part of the present issue. To return to Mr. Adamson, it is to be noted that he is of opinion that pioneer work must receive more attention, and that every delay in taking advantage of an improvement, whether due to the conservatism of an employer or the suspicion of employees, is "as dangerous to the welfare of the part of the world that is guilty of it, as interference with the circulation of an artery is dangerous to a limb of the human body." This is no less than plain good sense; and the moral was very much strengthened from a local point of view by the citing of the case of Manchester as an example of what should be avoided. Manchester, remarked Mr. Adamson, was an important centre of progressive engineering fifty years ago; but it was not so now. The members of the Association, instead of devoting proper attention to new fields, had been diverting all their energies to reducing the cost of accepted articles; and what was originally engineering had deteriorated into mere manufacturing. New development should go hand in hand with the more profitable repetition work, so that there would be other branches to maintain the continuance of the business as changes in trade arose. To sum up, he said that it was only by pioneer work that engineers could justify their existence.

Scottish Junior Gas Association (Western District).

The Hon. Secretary of this Section of the Scottish Junior Gas Association (Mr. G. Braidwood) has issued an intimation that an ordinary meeting of the Association will be held in the Technical College, Montrose Street, Glasgow, next Saturday evening, at which the business will consist of a paper by Mr. Henry Rule, of Falkirk, entitled "Modern Stoking;" and discussions on the following questions: (1) "How should an incandescent burner be adjusted to give the best results?" (2) "What is the most suitable pressure to give on district mains?" (3) "What method of charging gives the best results—light charges at short intervals, or heavier charges at longer intervals?"

Professor Lewes on Liquid and Gaseous Fuels.

We have received from Messrs. Constable and Co., Limited, a recent addition to their "Westminster Series" in the shape of a volume on "Liquid and Gaseous Fuels, and the Part they Play in Modern Power Production," by Professor Vivian B. Lewes, F.I.C., F.C.S. The author does not submit his book with the idea that it shall take the place of well-known works of reference, but rather his object being to give a general sketch of the whole subject and its bearings upon the power problems of the day, and leave the student to refer to such standard works as may be necessary for the detail of various applications. The contents are divided into ten chapters; and there are 54 illustrations. In an appendix are given some useful tables, which are followed by a bibliography and an index. We purpose noticing the book (the price of which is 6s. net) more fully in an early issue.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 444.)

THE Stock Exchange has again had to go through a period of great nervousness, which culminated in the middle of the week and relaxed before the close. On the reopening on Monday, the calmer aspect of the trouble raging in America had a fairly soothing effect upon the general position; but apprehension of gold withdrawals drove Consols down a good ¼. The calm of Monday was rudely disturbed next day, and the situation became very strained. Money was getting tighter and tighter; and this, with liquidations in full action, sent everything down. Consols fell another ½. Matters got to the worst on Wednesday, when the settlement of the long account gave rise to much apprehension. It was foreseen clearly that the Bank rate must be substantially advanced; the only question being, how much. The only exception to the general depression was Consols, which rose at the prospect of the atmosphere being cleared. Thursday was a peculiar day, and movements were irregular. Two failures over the settlement did not tend to improve things; and the closing of accounts against the Friday holiday had its effect. But the change in the Bank rate had a reassuring influence on the gilt-edged market; and Home Rails took a high jump upon rumours of all sorts of improbabilities. Advices from New York were better, too; so that on the whole those interested could breathe more freely. Saturday continued in about the same frame. Americans and Home Rails, after some hesitation, were rather better; but the continued tightening of money remained a formidable factor. In the Money Market, the course of things is sufficiently indicated above. On Thursday, the Bank of England rate of 4½ per cent. (fixed on Aug. 15) was raised to the very rare one of 5½. An advance to 5 would have been useless; and an advance to 6 a little too steep a step. But it has come since. Business in the Gas Market was about a fair average. As might be expected in the state of things generally prevailing, prices in a few instances are lower, but not much. In Gaslight and Coke issues, the ordinary was affected to the extent of a couple of points—transactions ranging from 93½ on Monday to 91¼ on Saturday. The secured issues were fairly steady; the maximum changing hands at 87 and 87¾; the preference at 105 and 105¾; and the debenture at from 82 to 83. South Metropolitan was quiet and unchanged, with dealings marking from 119½ to 120½. The debenture was done at from 82¼ to 83. Commercials were neglected; the 4 per cent. alone being done at 103½. In the Suburban and Provincial group, Alliance old fetched 20, Brentford old 249 (a fall of 1), and Southampton 110. The Continental Companies were almost stagnant. There were only two transactions in Imperial, marked at 175 and 176, and one in European part-paid at 18½. Tuscan debenture made 101 and 101½. Among the undertakings of the remoter world, Bombay changed hands at 6¾, Primitiva preference at 5, ditto debenture at 94, River Plate at 12⅞, ditto debenture at 95, San Paulo at 13⅜ and 13⅝.

ELECTRIC LIGHTING MEMORANDA.

The City Electric Lighting Demonstration—Cost per Candle Power per Annum—On Spectacular and Uniform Street Lighting—A Small Amount of Water and a Big Inconvenience—A Lapse from the Path of Virtue.

THE City of London and the Charing Cross Electric Lighting Companies are endeavouring to show great things in the City in the matter of public lighting. The executive of the former Company suffered frightful torture and prickings of conscience when the high-pressure gas-lamps went up in Queen Victoria Street; and, departing from their policy of *laissez faire*, they fretted and fumed until the City authorities gave them permission to show what they could do in the City streets in the way of illumination by modern means. A commencement with the work of equipment in the allotted thoroughfares has been made in Cannon Street, where flame arc lamps have been suspended centrally over the roadway on ✕ wires attached to the buildings on either side of the street. We understand that the electric ambulance arrangements of the City have in good time been brought up to a high state of efficiency. Be that as it may, after allowing this means of suspension, the next thing the City authorities will no doubt countenance will be overhead transmission of electricity in City streets. The increasing network of wires over London thoroughfares is not looked upon with any great composure in some quarters; and every addition augments danger in boisterous weather. We rather fancy, in the deep-cut channel that is formed by the high buildings flanking Cannon Street, that, in squally weather, the behaviour of these flame arcs will be somewhat sportive, unless they are rigidly braced in position. When the lighting by the lamps was started at the end of last week, it was noticed that the lamps cast deep shadows in the road below; and the slight breeze and vibration caused those shadows to be very fitful. One advantage claimed for the suspended lamps is that they dispense with lamp-posts. "Few people," we are given to understand by an electrical contemporary, "realize what a nuisance lamp-posts are to pedestrians;" if only "few" people realize the nuisance, then they are not a nuisance to the many. But we

believe that many people do realize the nuisance of big arc lamp-posts and the ponderous gibbets of the trolley-wire system of traction. The electrical industry introduced into the streets these ungainly looking structures for arc lighting and traction; and therefore it is perhaps only right the electricians should do what they can to lessen their number, providing that, in removing one evil, they do not introduce another. The trimming of the flame arcs is to be accomplished by tower ladders, which in narrow Cannon Street will not be welcomed by drivers or police, unless the tower ladders go their round, with the dust cart, well before eight o'clock in the morning. It will be interesting to learn, too, whether, if a fire occurs in Cannon Street, the lighting of the whole thoroughfare will be jeopardized. As to the lighting itself, it does not in anyway put the high-pressure gas lighting in Queen Victoria Street to shame. The Cannon Street lighting is a showy example of unequal and unsteady illumination; that of Queen Victoria Street the exact opposite. However, the new lighting of Cannon Street is an improvement on the testimonial to sleepy headedness supplied by the old blinking arc lights in certain of the City streets—at £26 apiece!

Buried in the volume of proceedings of the Incorporated Municipal Electrical Association are some figures on public lighting by gas and electricity prepared by the restless Mr. Hadyn Harrison. From returns received from 150 towns, he finds that the average inclusive charge per lamp for gas is £2 14s. 4d., for electric arcs £16 4s., and for glow lamps £2 15s. 8d. With a sublime contempt for facts, Mr. Harrison assumes for the arc lamps an average illuminating power of 600 candles, for the electric glow lamp 50 candles, and for the gas-lamp 40 candles; and so he finds out that the average cost "per candle per annum" is 7·4d. for electricity and 16·4d. for gas. Nominal candle power and useful candle power are two different things, and so are assumed and real candle powers. But how glad some electricians are to fly from the nerve-shocking solid total cost per annum for street lighting by electricity to that diaphanous refuge "candle power per annum." But "candle power per annum" does not satisfy municipal reformers and the general body of ratepayers. It may go down all right with municipal Progressives and Socialists; but that is a point on which we have not made inquiry.

A fortnight ago, some comments were made in the "Memoranda" on an editorial in the "Electrician" treating of the subject of "Specifications for Street Illumination." Mr. Kenelm Edgcumbe has also been attracted by the article, and has been spreading himself out in the correspondence columns of our contemporary. In his first letter, he gives two curves, one of the illumination of the flame arcs in Oxford Street, and the other of the incandescent gas-lamps in Kingsway. The minima of illumination are about the same, 0·1 candle-foot; but the Oxford Street lighting, in Mr. Edgcumbe's opinion, "is a splendid example of lighting," and the Kingsway lighting an example "merely of uniformity;" and, it may be added, of uniformity obtained in a thoroughfare bounded by vacant space, rough railings, and hoardings, and not by large buildings with surfaces that give considerable aid by reflection. It is a new doctrine that uniformity in street illumination should be a reproach; but evidently it is so in the eyes of this self-appointed electrical teacher of principles in street illumination. The omnispective Mr. Edgcumbe also asserts that "the public does not ask for an even illumination, although the gas industry would feign [it may be suggested he means fain] have it otherwise, knowing as they do that this is their sole chance of showing any superiority over electric light." Can we do more than bow to this superior knowledge of the requirements of the public? At the same time, we acknowledge with the profoundest gratitude the condescension of Mr. Edgcumbe in admitting that gas has this one point of uniformity [he has overlooked the one of cost] upon which it can show a superiority over electricity. If a fairly uniform illumination is not the best index of good street lighting, what is? It will be remembered that the "Electrician" suggested that, if illumination measurements are adopted as the test, it would probably be better to make measurements comparatively near to the lamp under test; the minimum illumination being deduced if required. It was pointed out in the "Memoranda" a fortnight ago that this idea was conceived for the benefit of the electric flame and ordinary arc lamps, whose concentrated brillance around the lamp standard makes such a test favourable to them. The same objection holds good in regard to Mr. Edgcumbe's proposition that "a very satisfactory index to the value of the lighting is afforded by the *average* horizontal illuminating power measured along the centre of the roadway." It is noticed that Mr. Edgcumbe does not criticize the assertion of the "Electrician" that great care is necessary in street illumination measurements, because "an arc lamp is by no means a very steady source of illumination.'

It was only "a small amount of water" that leaked through a sub-station entrance grate that caused an extinction of light for nearly five hours in two districts and for nearly three-and-a-half hours in another district at Worcester on a recent Wednesday evening. Only lately in these columns reference was made to the smallness of the causes that can produce great inconvenience in connection with electricity distribution; and this is another instance. We are indebted to the "Electrical Times" for the particulars concerning this happening at Worcester. The leakage of the "small amount" of water caused a surface leakage on a high-tension cable end connection. This flashed momentarily, igniting a small accumulation of gas, the explosion of which broke the inner lid and lifted the outer lid of the entrance-grate, which latter did not fall back into its water-tight position; thus allowing an excess of water to run into the chamber. The further leakage caused a complete short on one high-tension main; the end connection being burnt out. In a quarter of an hour, the electrical staff got to work, but nothing could be done owing to the pungent fumes in the chamber. Later smoke was reported from another sub-station; and the current was switched off a third district to prevent further damage, and to allow the chamber to clear. It was found that a 36-kilowatt transformer had been broken down, and that a low-tension cable had developed a fault, so feeding back into the first fault. And it all arose from a "small amount of water." What things must have been said about that "small amount of water." It may surely be taken for granted that the Worcester Electricity Department has told the people of the old city all about the "reliability" of electricity supply. But the citizens have an ancient acquaintance with electricity supply, and take what is told them with "a grain of salt."

The Maidstone District Council are not playing the game fairly over their financial conduct of the Maidstone Electricity Undertaking. The report of Mr. A. Warr King on the accounts of the department states that, after the repayment of loans, there was only a balance of £29 18s. on the year's working to March 31 last. This is not a fat profit. As a matter of fact, it is not a profit at all, as the accounts show an accumulated liability of £9142 under the head of temporary loans, £7004 of which has been allocated to capital account. By means of these temporary loans, the Electricity Committee are evading their obligation in respect of the repayment of principal, and that is neither legal nor businesslike. Among other points that came to light at a meeting of the Council at which the Accountant's report was presented, is that the department is not yet paying for certain machinery that has been in for some years. Another thing—and this is a matter of which the Electrical Contractors' Association should take note—the Council have been wiring houses free of charge, and are allowing motors to be hired. We do not know whether they have power to let motors on hire; but it is pretty clear that they have not the power to wire houses free. Upon this lapse from the path of financial virtue on the part of the Council, produced solely by their trading in electricity, the Local Government Board will no doubt in due season have something to say which will not put the responsible parties in the best light.

SUPPLY OF FITTINGS BY LOCAL AUTHORITIES.

THE Model Bills and Clauses which have lately been issued as guides in the drafting of Bills for the ensuing session contain some important amendments in regard to the supply of gas, water, and electric light fittings by local authorities. They mitigate to some extent the objection entertained by suppliers of gas to the system of free-wiring adopted by local authorities.

In the Model Gas Bill, clause 32, giving power to supply gas-fittings, &c., has been extended by the addition of the following proviso:—

(*a*) It shall not be lawful for the corporation to expend money (except through a contractor) upon the provision of such fittings, or of labour and materials required for the fixing, repairing, or removal thereof upon or from the premises of their consumers or prospective consumers.

(*b*) The corporation shall so adjust the charges to be made by them for any such fittings, or for the fixing, repairing, or removal thereof, as to meet any expenditure by them under the powers of this section in connection therewith (including interest upon moneys borrowed for those purposes), and all sums applied to sinking fund for repayment of moneys so borrowed.

(*c*) Every sum charged by the corporation to a consumer in respect of the provision of such fittings, or the fixing, repairing, or removal thereof, shall be separately stated on every demand-note delivered by the corporation to the consumer.

(*d*) The total sums expended and received by the corporation in connection with the purposes in this section mentioned in each year (including interest and sinking fund) shall be separately shown in the published accounts of the gas undertaking of the corporation for that year.

Clause 21 of the Model Water Bill, as amended, sets forth that any fittings let on hire shall not be subject to distress, or be liable to be taken in execution under proceedings in bankruptcy, if they are distinctly marked as being the property of the parties letting them; and then follows the provision above quoted, with the substitution of the word "water" for "gas" towards the end of the proviso.

The miscellaneous model clauses now contain a new one dealing with the supply of electrical fittings. It sets forth that a local authority may provide, let for hire, and fix, repair, and remove (but shall not manufacture) lamps, meters, electric lines, &c., for lighting and motive power, and for all other purposes for which electrical energy can or may be used, and may provide all necessary or proper materials and work in respect thereof, and may demand and take such remuneration or rents and charges, and make such terms and conditions, as may be agreed upon. Then follows the clause as to the fittings not being subject to distress; and this is succeeded by the new one above quoted, with the necessary verbal change near the end.

BRITISH OR METRIC MEASUREMENTS.

From the far-off time when the previous divisions of our country became one consolidated England under King Edgar (between the years 957 and 975), and he declared that there should be "one money, one measure, and one weight, such as is observed at London and Winchester," down to the present year, when in March our Parliament discussed the Metric Bill, the question of our weights and measures has always been one full of differences and of difficulties. The uniformity early decreed has never been realized. Of course, this is not at all surprising. When commerce is restricted to a few articles of manufacture and exchange, it is not even then always convenient, or even possible, to utilize the same standards of measurement; but when we reach an advanced stage of civilization, with all its diversities in trade, and with entirely new commercial products springing up on every hand, it is simply inevitable that there should be almost equal diversity in methods of measurement. This appears to us to be one of the essential facts of the problem of standard weights and measures which is sometimes lost sight of by both the advocates and the opponents of the metric system.

Again, it is so easy to forget that the circumstances of nations vary just as much as the circumstances of individuals. What may be good policy or a sound system for one country may be quite the reverse for another. This was frequently overlooked during a recent political discussion, also bearing upon the trade of our country. There are always historical developments to be borne in mind, as well as fundamental differences due to locality and geographical situation. What recently formed country, made up of a lot of petty States like Germany or Italy, may find it advisable to do, either in the way of government, trade, or measurements, may be a very different thing from what is suitable in a consolidated country of 1000 years' standing and continous growth, like England. Yet the prometricists say: "What 450 millions of people in many different countries have adopted as a system of measurement must of necessity be what should be used by 120 millions of people in other countries." This, of course, does not follow at all; and all that can be said is to claim, as some evidence of the general suitability of the metric system, the fact that a great number of countries have adopted it. The anti-metricists retort, on the other hand, that the greatest commercial countries (with the important exceptions of Germany and France)—namely, the British Empire and the United States of America—use a different system. They appeal, rather sentimentally and feebly some people may think, to "the good, old, and well-tried system of their forefathers," and object to what, in their narrowness, they call "foreign standards and foreign names." They also confound the survival of terms, such as *livre* and *sou*, with the principle of the metric system, and point to such survivals in nomenclature as proving the inherent weakness of the adopted system. The marvel is, after centuries of habit in use and name, not that there are still such popular denotations of measurement, but that there are not a great many more. In short, from whatever point of view the question of weights and measures is looked at, there are yet many aspects of it, theoretical, practical, scientific, or commercial, which must be further investigated before any one definite system can be compulsorily adopted in this country.

In support of the metric system, the Decimal Association have long been active. To counteract this, and to help further elucidation of the subject and prevent any hasty and ill-considered conclusion being arrived at, is the British Weights and Measures Association, with Mr. George Moores as Secretary. The object of the latter is threefold—partly negative and partly positive. It is to oppose legislation calculated totally to abolish the present British measurements. Actively, it is to promote legislation to legalize the use of decimal divisions of existing Imperial units, and to establish, as a legal unit, the weight of a cubic inch of water for scientific purposes. This appears to amount to a desire to adapt the advantages of the co-related standards of the metric system to our own. A third object of the Association is stated to be "generally to simplify weighing and measuring operations by eliminating useless, and standardizing useful, weights and measures." Whatever views may be held upon the legislative portion of the Association's objective, there can be no doubt as to the laudability of simplification and elimination. Further than this, we, for our own part, heartily welcome anything tending to the extension of our sources of information on moot questions, and any Association whose object is lawfully to promulgate what they hold to be the interests of the country at large, and the industrial community in particular. Only by fuller discussion can fuller knowledge come.

In addition to the ordinary methods of distributing leaflets giving the views of experienced persons, searching inquiries are to be conducted on the spot as to the actual working of the metric system in countries which have adopted it. The first of such reports now lies before us. It is an interesting and able account of the Secretary's visit to Denmark—not perhaps a very important country to begin with, but significant, inasmuch as in March of this year, a Bill definitely establishing the metric system in that country passed both Houses of Parliament and became law. We say "definitely" establishing the metric system, for thirty years ago a Bill with a similar object passed the Upper House; and no doubt for many years a growing familiarity with, and use of, metric measurements have been going on. Thus the report says that "during the discuss.ons in the two Houses hardly anything was said against the introduction of the metric system."

Denmark has a population of just over 2,500,000; 40 per cent. of the people being engaged in agriculture. Its foreign commerce is considerable and increasing, reaching in 1905, £25 0s. 5d. per head, as compared with £22 10s. 1d. per head in England. Its engineering interests are limited; but interviews with representatives of engineering and shipbuilding firms seem to show that they prefer millimetre scales for their drawings, partly because their bar iron comes from Germany, but that sizes of screws, tubes, &c., are indicated in inch dimensions—a double system that cannot be altogether satisfactory. The general upshot is that "all Denmark could do was to adopt that system—or as much of it as was practicable—which suited them best for the time being." If they trade with metric countries, they use metric measurements; if they send drawings and goods to our own country or to the United States, they use feet and inches. Is not that, under the circumstances, a very simple and practical solution? Could it not profitably be adopted by British traders to a greater extent than perhaps it is at present?

The gas industry is, as it may be termed, a specialized industry, having especial requirements in the way of measurements, extending from the minutest calculations of the laboratory to the ordinary transactions of commerce. Its manufacturers still have extensive connections with foreign countries using, almost invariably, the metric system of weights and measures. Every care should be taken to speak to possible or actual customers abroad in that commercial language of words and figures that the purchasers can best understand. We believe this is increasingly being recognized, though we know instances of trouble and difficulty experienced in this respect, through English manufacturers not conforming to it when carrying out contracts abroad. We believe that greater attention being given to such matters, combined with instruction in schools and technical colleges as to metric measurements, will gradually lead to the elimination of the redundancies of our own system, and pave the way for the eventual adoption of weights and measures proved to be of the greatest convenience and use to mankind.

WATER ANALYSIS.*

This book having run into the eleventh edition is a sufficient guarantee of its great value and usefulness, and will show the popular interest taken in the subject. "Wanklyn's Analysis" was first brought out in 1868. This was the earliest book published on water analysis; and when describing the "ammonia process," the readings have always been expressed by Professor Wanklyn in terms of parts per million. In England, two other scales—namely, parts per 100,000 and grains per gallon—are employed by chemists using the ammonia process.

Water engineers will remember that the British Association appointed a Committee to establish a uniform system of reading the results of the chemical and bacteriological examination of water and sewage. This Committee issued a report as follows: "That it is desirable that the results of analysis should be expressed in parts per 100,000." Then follows the standard methods of recording the results. The Committee consisted of Professor Ramsay, Sir William Crookes, Professor Frank Clowes, Professor Percy F. Frankland, Mr. R. Boyce, and Dr. S. Rideal. These gentlemen urged the use of the system of recording the results adopted originally by the Rivers Pollution Commission, and confirmed by the Committee of the American Association for the Advancement of Science in 1887.

It would be useless to point out in detail here the great difference in the methods employed in water analysis. Suffice it to say that one chemist expresses the results in 100,000 parts; another in milligrammes, or parts in a million; another in grains per gallon. Other differences in analysis and modes of expression are of still greater importance; they are misleading and are not intelligible to the water engineer, and the results cannot be compared. Therefore they are useless to those having charge of the water supply. The analyst and his processes are distrusted because they cannot read and compare the different results which are given in discordant chemical expressions; the variances cannot be otherwise than discreditable to the profession.

When Dr. Meymott Tidy and Dr. E. Frankland, with nearly all the professional analysts, including the names of the Committee here appended, also the Rivers Pollution Committee and the public analysts who issue the monthly Official Reports of the London Water Board, disagree with the nomenclature used in "Wanklyn's Analysis," it is useless to discuss the methods employed or the differences in terms used to express the values of the samples submitted for analysis. The matter is so serious to the general community that it must be severely condemned. It requires compulsory powers to insist on the results being all tabulated in the same terms, and always adhered to, so that they cannot be misleading. Whatever the difference in the methods employed may be, surely there could be a consensus of opinion on the mode of expression. It is now fully recognized among all communities

* "Water Analysis. A Practical Treatise on the Examination of Potable Water." By J. Alfred Wanklyn, M.R.C.S. Eleventh Edition, revised by W. J. Cooper, with Memoir and Portrait of the Author. London: Kegan Paul, Trench, Trübner, and Co., Ltd.; 1907.

that an absolutely pure and wholesome supply of water must be procured for the smallest villages, and every town and city. The health of the inhabitants must be preserved no matter at what cost, and the medical officers and the sanitary authorities must be compelled to carry out the duties devolving on them, or the law should be put in force. Neither the sanitary authorities nor the population of rural districts are properly alive to the great importance of an abundant, good, and wholesome water supply. It is the duty of the medical officer to so disseminate this information that the farmer and his dependants in the rural districts may wake up to the knowledge of how to live in health, and save their children from preventable diseases caused by impure water, Outbreaks of disease have been very frequently traced to polluted wells; and it is of the first importance that rural districts should possess a supply of water beyond suspicion.

The information contained in this work will enable an intelligent community to satisfy themselves if the supply of water is of a pure and wholesome character; and by a careful study of the pages they may be able to form a judgment as to the risk they are under when using a polluted surface well—"of all the dirty water that is drunk, the water from surface wells is the most dangerous." They may also ascertain if the supply is abundant, and arrive at an approximate cost. The Public Health Water Act (3) enacts that: "It is the duty of every rural sanitary authority to see that every occupied dwelling house has a proper supply of pure and wholesome water."

In "Wanklyn's Analysis" the intelligent reader may obtain all necessary information to enable him to form an opinion upon the purity of water of a doubtful character; while the professional analyst will find methods fully up to date. The first part of the book is devoted to the discussion of what is a potable water, written in concise language for the non-professional man. There is a full description of the method of collecting samples of water for analysis, the consideration and discussion of specific gravity, total solids, chlorine, organic matter, poisonous metals, and conclusions following analysis; also preparing reports, &c.

Part II. is designed for the professional man, and is devoted to the description of specialities in which the water analyst is constantly engaged, and a fully and detailed mineral analysis is rendered. The deleterious effects produced by drinking impure water are well known. Many supplies that are still allowed in large towns are simply a disgrace to the authorities, notably the peaty water laden with iron and vegetable matter, which fills a large portion of the mains with incrustation and dirt. Frequent flushing of the mains is advocated; but sedimentation reservoirs and sufficient filtering area at the intake are absolutely necessary. It is quite clear that the latest scientific methods of filtration have not yet become universal. Recording meters, adapted for automatically recording the rate of filtration, and apparatus for ascertaining by bacteriological analysis the number of bacteria present at certain periods of delivery, are required. If the standard of 100 microbes to the cubic centimetre should be adopted, then it is necessary that means be used to compel the filtration to be carried out at such speed as would secure this result. We are no longer groping in the dark, but have definite material to work upon, with meters and automatic recorders, so as to work the filters securing definite results. A better standard than the above would be that no pathogenic germs should be allowed to pass the filters, so that consumers would be completely safeguarded.

Whatever may be the differences of opinion among the professors, as described in this work, it must be acknowledged that perfect filtration conducted on scientific methods with up-to-date manipulation, and the rate of filtration automatically recorded daily, is an absolute safeguard against the dissemination of disease germs. Every water engineer should have some knowledge of bacteriology. Professor Wanklyn did much good by placing the work of the analyst in its true light; and notwithstanding the differences of opinion, and the regrettable methods of stating the results, this eleventh edition will do much to bring the matter nearer to a definite issue, when Professor Wanklyn's last warning and advice to chemists working the ammonia process will not be needed.

A chemical and bacteriological report assist each other, or should go together; but neither analysis is of much value unless the source is properly investigated. As before stated, the engineer should be thoroughly conversant with up-to-date methods of analysis, and be compelled to make continuous tests. All people who take an intelligent interest in water supply—and who is there who does not?—should read "Wanklyn's Analysis." It is written with the greatest care; and every effort is made to present the subject clearly and concisely. Experiments are carried out with the most exacting precision. There is nothing being done in water engineering to-day of more value in placing the profession in the higher ranks than the efforts made to procure a safe and wholesome water supply; and "Wanklyn's Analysis" will help materially in bringing analytical science up to date.

The amalgamation is announced of the engineering firms Applebys Limited and the Temperley Transporter Company. These firms are well known as manufacturers of cranes and transporting machinery of every description—specializing in shipyard, dock, and harbour equipments, steel-works, gas-works, coal-handling, and contractors' plant. The firms will henceforward trade under the title of "Applebys Limited," with offices at No. 58, Victoria Street, and works at Glasgow and Leicester.

PERSONAL.

Mr. S. J. ACLAND, who recently resigned his appointment as Secretary and Manager of the Brynmawr and Blaina (Mon.) Gas Company, has just undergone a severe internal operation, from the effects of which he is now recovering; and he intends having a complete rest from work for a couple of months before taking up any fresh appointment.

We learn that Mr. R. BROWN, who until about five years ago held the position of Engineer and Manager of the Cambridge University and Town Gas Company (in which he was succeeded by Mr. J. Auchterlonie), has obtained the appointment of Manager of the gas-works at Iquique; and he was expected to arrive at Monte Video on Saturday. Before going to Cambridge, Mr. Brown was engaged at the Hastings Gas-Works under Mr. Charles E. Botley, with whom he served his articles.

In the "JOURNAL" for the 22nd ult., we noticed briefly an address by Mr. F. J. WEST, the retiring member of the Manchester City Council for Newton Heath, to a large meeting of ratepayers, in view of the approaching municipal elections. We are pleased to find that the result of these last Friday was that he succeeded in defeating the Labour candidate by a majority of 720 votes. He deserves the hearty congratulations of all his friends, for he has had a very severe fight with the combined forces of Labour, Trade Unionism, and Socialism, whose representatives did all in their power to get their man in. That these congratulations are justified will be evident when it is mentioned that last November a sitting member of the Council defeated the Labour opponent by only 23 votes, and that at the previous election a Labour candidate defeated a very good local man by 55 votes in the Newton Heath Ward, the ratepayers in which consist chiefly of the working classes. Mr. West's victory, therefore, is at once a testimony to the popularity of his principles, and a distinct set-back to the socialistic programme of the Labour party in the district. We think that his defeat would have been a serious loss, inasmuch as, though one of the two youngest members of the Council, by the majority of whom he is held in high esteem, he has been made Deputy-Chairman of the Rivers Committee, where his engineering experience has doubtless been of special value.

THE TAR-SPREADING COMPETITIONS.

The Judges' Report.

OUR readers are aware that towards the end of May last a series of competitions were carried out at Staines, by the Roads Improvement Association, on behalf of the Royal Automobile Club and the Motor Union of Great Britain and Ireland (by whom the cost was defrayed), with the view of ascertaining the best preparation of tar for use on roads for the prevention of dust, and the best machine for spreading it. In response to the invitation of the Association, seventeen entries were received for the competitions—eight spreading-machines and nine preparations of tar. In addition to the tars entered by the competitors, the Judges themselves tested, for comparative purposes, three different kinds of tar. The machines were worked on three classes of macadam roads—*i.e.*, granite, flint, and gravel; but the preparations of tar were applied on the granite road only. An account of the competitions was given in the "JOURNAL" at the time (see Vol. XCVIII., pp. 575, 641). The Judges' Committee consisted of seven members of the Council of the Roads Improvement Association (Messrs. R. Todd, W. Worby Beaumont, Colonel Crompton, Howard Humphreys, Rees Jeffreys, Douglas Mackenzie, and Earl Russell), eight road engineers, appointed after consultation with the Incorporated Association of Municipal and County Engineers (Messrs. John A. Brodie, H. F. Bull, J. F. Hawkins, G. W. Manning, H. P. Maybury, H. E. Stilgoe, W. J. Taylor, and H. T. Wakelam), and four other members (Messrs. Bertram Blount, W. J. A. Butterfield, P. C. Cowan, and Dr. Guglielminetti). They have just made their report.

After setting forth the circumstances which led to their appointment, the Judges explain that unfavourable weather militated against the carrying out of the trials as originally arranged. It is generally accepted that an application of two coats of tar is necessary for preserving the surface of a road, and the Judges were desirous of carrying out the trials under this condition; but this, for the reason mentioned, could not be done. It could not be expected, therefore, that the surfaces treated with one coat only would be durable; and the Judges explain that the trials in respect of durability do not reflect on the machines competing. The final judgments and awards in the machine competition were based upon the machines only. However, in spite of the generally unfavourable nature of the weather, they say the results, on the whole, may be considered satisfactory; and much useful information has been obtained in connection with the comparative merits of the various materials used and of the methods of spreading them. They consider that enough has already been done to show that "machinery can be successfully applied for this purpose, and that by the use of such machinery tar spreading can be carried on with great rapidity after preliminary preparations have been made." The Judges say the cost of spreading tar by machinery has worked out at a far lower figure than the

cost of applying the same quantity of the material by hand. The Judges pass on to deal with the machines submitted.

TAR-SPREADING MACHINES.

Aitken's Patent Pneumatic Tar-Sprayer.

The Judges consider this to be a well-constructed machine, possessing many important advantages. It is self-contained, and can be moved rapidly from one part of the road to the other. It can also cover a considerable superficial area of road in a day's work. Its construction is solid and well thought out, and the cost of working and maintenance may be expected to be low. The Judges believe that by the use of this machine, under the most favourable conditions, the actual cost of laying on one coat of tar in a sufficient quantity may be cut down to almost 1-50th of a penny per superficial yard, or with a road 6 yards wide to approximately £1 per mile. This includes everything that ought to be charged to the cost of the operation, interest and sinking fund on the plant employed, a fair sum for upkeep, and ample allowances for fuel and labour, but is exclusive of the cost of tar. Though in point of rapidity of working and excellent mechanical construction the Judges put this machine at the top of the list, in some respects the results of the spreading were not so satisfactory as in other cases. This arises from the fact that the distributor was not properly adjusted. The Judges have decided to award the first prize of 100 guineas and the Association's Gold Medal to this competitor.

"Emulsifix" Limited.

This machine is of the nature of a special form of water-cart having means for mechanically mixing tar and tar oil with a certain proportion of water, and spraying the road before the mixture has time to separate. Although the Judges are informed that this competitor put an additional application on to the road shortly after the actual trials, yet little or no trace of the application was to be seen shortly afterwards. It should be mentioned that this competitor intimated that it was impossible for his machine to use the standard tar as supplied by the Association to the other tar-spreading machine competitors; and, under the circumstances, the Judges allowed him to bring his own material.

Johnston Lassailly Patent Tar Road-Binder.

This machine consists of a separate portable boiler for heating the tar up to 200° C. or over, from which the heated tar is transferred to distributing carts fitted with trailing brushes for evenly spreading it. The work done by this apparatus was good. A heavier coating of tar was put on than in the other cases; and, chiefly owing to this, the durability of the coating has been greater than in the case of any of the other competitors. Against this must be set the consideration that the machinery is cumbersome to handle, the working consequently slow, and therefore more costly than that of other competitors.

"Tarmaciser" Limited.

Owing to an accident on the road *en route* to the scene of the trials, this machine was unable to compete. With a view of ascertaining its comparative merits, a special test was arranged and subsequently took place on the road between Swanley Junction and Farningham, in Kent. This trial was, of course, quite independent of the tests for the competition awards. The machine did not come up to its proof. It required a considerable amount of adjustment prior to starting, and then partially broke down while at work. Though there are probably possibilities for this machine, the Judges are of opinion that it cannot at the moment be considered an entirely practical apparatus.

"Tarspra" Limited.

This Company entered three machines. The first was a 700-gallon Thornycroft motor van, and resembled in some respects the Aitken machine. This competitor entered a 1000-gallon van, which was drawn by a small tractor. The third machine entered was a 200-gallon cart drawn by horse power. In all cases the principle of spreading the tar was the same. All three machines worked well, and spread the tar evenly. The 700-gallon Thornycroft motor van is well designed. The workmanship is not quite equal to the Aitken machine, and probably the cost of upkeep will be greater. It should be mentioned, however, that different sets of nozzles can be used with these machines, and the number of square yards covered per gallon of tar can be adjusted to suit the road surface or the wishes of the person treating the road. The Judges have decided to award the 700-gallon Thornycroft "Tarspra" machine the second prize of 50 guineas and the Association's Silver Medal.

The Thwaite Anti-Road-Dust System.

This consists of a portable tar-boiler, which holds 300 gallons of tar; and this competitor's principle is to raise the tar to a high temperature, and consequently it does not require so much pressure to lay it on the road. The Judges were impressed by the good working of this machine, which seems to be simple and effective. The first cost of the apparatus is very moderate; but operating costs are not so low as the Aitken or "Tarspra."

Mr. Reeson's Patent Machine.

[Used by the Gaslight and Coke Company.]

This apparatus is for putting on a preparation of tar; but it was not entered for the tar-spreading machine competition. It consisted of a tank fitted with gravitation sprinkler and two rotary brushes. At a special test of this machine on the road between Swanley Junction and Farningham, Kent—at the same time as the special tests of the "Tarmaciser" were made—it worked satisfactorily, and was very favourably commented upon. The heating arrangement consisted of a Wells light burner; paraffin being the heating agent. The air pressure for this heater was obtained by means of a hand pump.

PREPARATIONS OF TAR.

The preparations of tar tested were of two classes—(1) those containing very little tar, and (2) those in which tar formed the main ingredient.

In the first class were the compounds "Crempoid R," "Crempoid D," "Ermenite," "Hahnite," and "Pulvicide." The results of treating the roads with all these compounds may be dismissed in a brief paragraph. Within a very short time after their application—*i.e.*, a week in the case of "Ermenite," a fortnight in the case of the "Crempoids" and "Pulvicide," and a month in the case of "Hahnite"—they had practically disappeared. The compounds have not the durability of tar; and the Judges do not consider their use as economical. Moreover, complaints have been received to the effect that the dust raised from the sections of the roads treated with some of these materials is injurious to the eyes of those using the roads, and to the frontagers living along their routes.

The preparations containing a large proportion of tar were, on the whole, very satisfactory. We deal with them in their order of merit.

Clare's Patent Tar Compo.*

This was applied to a quarter-mile section of road extending from the steam laundry at Staines to a point a quarter-of-a-mile eastward from the same laundry by one of the smallest of the "Tarspra" machines, similar in type to the 200-gallon one entered in the tar-spreading machine competition. This section of road, as regards dryness of surface, was approximately in the same condition as the other lengths. The macadam was in good condition. The quantity of the material appears to be one gallon to 7 square yards, applied in two coats. At the price quoted by the competitor—3½d. per gallon delivered in London—and after making allowance for getting the material into position on the road, it works out, excluding the cost of spreading, for a coating of 7 square yards to the gallon, at 0·57d. per square yard of road surface, or approximately £25 per mile of road six yards wide. From the time of laying until recently it has been uniformly good, and is now in better order than any other portion of the road. The surface is wearing rapidly, especially in the centre. The Judges have decided that the "Ballymenagh" 100-guinea Trophy and the Gold Medal of the Association for the best preparation of tar for road purposes be awarded to Messrs. Clare and Co., of Liverpool. The smell of the material is relatively evanescent and unobjectionable.

In the Judges' opinion, the success of the Clare Company's compo. is greatly due to the fluidity obtained. When applied cold (as recommended by the manufacturers), as was the case on the Staines Road, the penetration was very considerable. In spite of this, the tar has body enough to hold together in a highly satisfactory manner the small dust-forming particles. Moreover, it has been ascertained that the cost of treating or adding to tar by this method is not considerable, and is far more than compensated for by the extra penetration, as described above. The preparation flashes at ordinary temperatures, and special care must be exercised to avoid risk of firing during treatment.

The Gaslight and Coke Company.

"Oil-gas tar" was entered by this competitor. This material was applied to a length of road adjoining that of the Clare Company by a special form of machine devised by the Gaslight and Coke Company's Engineer, Mr. Reeson, which is commented upon under the heading of "Tar-Spreading Machines." This length of road is in a fairly good condition. Oil-gas tar probably penetrates deeper than anything else; but it does not form so durable a wearing surface, and consequently is not so great a protection to the face of the macadam as a good tar preparation. It is not a new substance, and has in the past been used in various places; but the actual material entered by this competitor is understood to have been a specially treated "oil-gas tar" from which the more readily volatile and "low-flash" constituents of ordinary oil-gas tar have been removed. The smell of the preparation was penetrating, and of the same character as that of ordinary oil-gas tar, but less strong and persistent. It would probably be very useful for the purpose of giving the first coat to a road, to be followed by one of coal-gas tar or other similar substance.

T. G. Marriott's "Marbit."

The third in order of merit of the competing preparations is "Marbit," entered by this competitor; but the condition of the section of the road treated is not quite so good as that of the first two named.

TAR SUPPLIED BY THE ASSOCIATION FOR COMPARATIVE PURPOSES.

In addition to the competing preparations, it is necessary to make some mention of the various kinds of tar supplied by the Association for comparative purposes.

1.—This was a new crude coal tar, which had merely undergone

* The makers of this preparation informed the Judges that it would in future be known as "Improved Dustroyd (Clare's Patent Tar Compo.)."

the ordinary mechanical separation process, supplied by the South Metropolitan Gas Company for the use of the tar-spreading machines on the Staines and Hounslow granite road and the Twickenham and Kempton Park flint road. The Judges consider that, though this was a fair average specimen of tar, it did not yield satisfactory results unless applied in quantity in excess of that found necessary in the case of the Clare patent tar compo. One gallon of the Clare material has given an exceedingly good surface to 7 square yards during the summer months; whereas in this case quite 1¼ times the quantity is required to give equal results, which greatly affects the total cost of the completed operation.

2.—This also was crude coal tar which had undergone the ordinary mechanical separation process, supplied by the Reading Gas Company for use in the tar-spreading machines at Ascot. It was far inferior for road purposes to that supplied by the South Metropolitan Gas Company. It was apparently unsuitable for spraying in the machines, probably owing to the foreign matter which it contained when it arrived in the tanks at Ascot.

3.—This was a "refined" or "freed" tar from the South Metropolitan Gas Company, and was kindly supplied by the Company for experimental purposes free of cost to the Association. This was also laid upon the road by a 200-gallon "Tarspra" cart. This is a coal tar from which the water and naphtha have been distilled, and has a specific gravity of about 1·24. The distillation serves to remove the ammonia, which is an objectionable constituent of tar for road treatment, and the light oils. The cost of this tar is about ¼d. per gallon above the same Company's market price for crude coal tar. The preparation answered well in the trial.

4.—This was an ordinary refined coal tar from the tar distillery, as supplied by Messrs. Burt, Boulton, and Heywood, of Silvertown. This material was applied by a 200-gallon "Tarspra" cart, similar to the one entered in the tar-spreading machine competition on a section of the Staines and Hounslow granite road. The specific gravity is about 1·21. The net cost at the wharf is about 3d. per gallon. For some reason this tar did not answer quite so well as the somewhat similar preparation from the South Metropolitan Gas Company; but it was fairly satisfactory.

5.—This was a blast-furnace tar, supplied by Messrs. R. & A. Reid, of Glasgow. It was applied to a section of the granite road between Hounslow and Staines by a 200-gallon "Tarspra" cart. The tar is derived from blast-furnaces using splint coal in the neighbourhood of Glasgow, and therefore offers a supply entirely independent of gas-works. Its specific gravity is 1·1; but it is highly viscous, and needs considerable heating to make it sufficiently fluid for laying on the road. Its smell is rather objectionable and persistent. The cost in London is 2¼d. per gallon, but appreciably less in the North. In order of merit, it comes after the refined gas tars.

JUDGES' OBSERVATIONS.

Speaking generally, the whole of the machines tested showed considerable originality and forethought in design; and, considering the short time the demand for this machinery has been before inventors, the results obtained are exceedingly promising. No doubt most of the machines exhibited can be improved; and when using the proper material in correct quantities, they are all likely to give satisfactory results. Suitable tar compositions are practically insoluble, yield no matter liable to be washed away into the watercourses to pollute and to cause damage, nor should there be any considerable quantity of tar-dust ground off the road surfaces after treatment. The Judges believe that the complaints made under this head previous to these trials have been due to the use of improper materials—that is, tar from which the more unsuitable compounds have not been extracted previous to it being used on the road. Now that this is understood, it is probable that most of these difficulties will disappear.

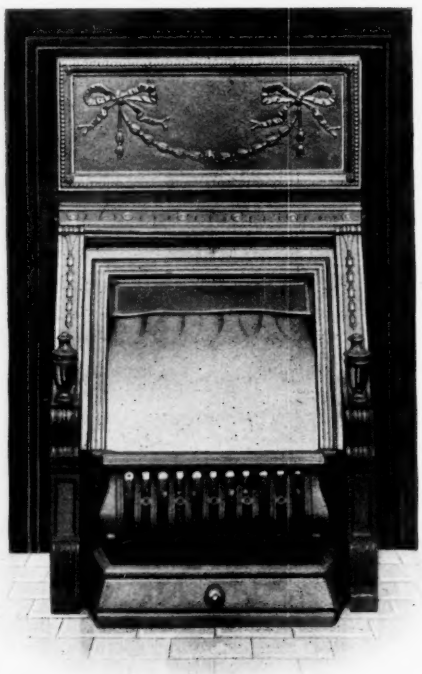
It will be noticed that little has been said in this report as to the Ascot experiments. The Judges consider that this portion of the work was not satisfactory, for several well-understood reasons. In the first place, the tar supplied from the Reading Gas-Works was apparently unsuitable for spraying by machinery. Through some unexplained cause, a great deal of foreign matter found its way into the tar, which blocked the nozzles of the machines, and caused very irregular working. Moreover, as regards the dampness of the road material, the road surface at Ascot compared very unfavourably with those at Staines and Twickenham. Some heavy rain had fallen in the night previous to the experiments; and the road being greatly sheltered by trees, the moisture did not dry out. It was therefore not to be expected that the tar would adhere to the surface of the road; and in consequence it could be seen that in many cases the tar, instead of penetrating, was lifted off by traffic in the form of a detached film, leaving the road unprotected.

The Judges desire to record their thanks to the Middlesex and Berks County Councils, the Staines Urban and Rural District Councils, and the Sunbury and Tedcington Urban District Councils, and their road staffs, for the facilities afforded for carrying out the trials; and to the South Metropolitan and Reading Gas Companies for supplying considerable quantities of tar at very short notice for the machine trials.

The thanks and appreciation of the Judges have also been conveyed to the Head Marshal (Mr. A. G. Reynolds), the Assistant-Marshal, the observers, and all those who contributed to the successful organization of these trials.

AN OPEN GRATE BURNING GAS COKE.

In the course of this year, more has been heard of smokeless fuel than in any other year within the memory of man or in the whole history of domestic heating. It is said that there is a demand for a solid fuel from which all the evils attaching to raw coal are absent—a solid fuel that is smokeless, that will give a cheerful fire, and will produce little dirt. If gas coke is not considered good enough for this purpose, then gas undertakings can turn out from their ordinary carbonizing plant a fuel the equal in every respect of the best that has yet been achieved in the way of reducing coal to a smokeless condition. Coke, however, is good enough if it is properly treated; but the ideas of the British public as to what they want, and the ideas of makers of coke-consuming grates as to what is required for the proper treatment of coke, have not hitherto coincided. What the public asked for, and will have, for domestic purposes is a good, open, live-looking fire; and if they can obtain such a fire, which is at the same time economical in fuel and innocent of creating dust and smoke, then from the public will undoubtedly come a considerable demand, providing the expense is not too heavy. The time is ripe for such a grate; and the Sinclair Iron Company, Limited, of Wellington, Salop, have appreciated this, and have designed one, which has been patented, and which fulfils the requirements of an open, live, incandescent fire.



The "Roseneath" Open-Fire Grate for Burning Coke.

The Gaslight and Coke Company are dealers in gas, coke, and "Carbo." They are not very particular which form of these smokeless fuels the public want; being prepared to trade with anyone in their district in all three commodities, and we have no doubt in two of them anywhere within reason, and at a price. The management of the Company, having put to the test the reputed merits of the "Roseneath" open-fire coke grate of the Sinclair Iron Company, and having found the claims justified, are taking the ordinary means of introducing the grate to the consumers; and the other day we had the pleasure of seeing a couple of the grates fitted at the Horseferry Road offices—one of them burning; and so cheerful-looking was the fire, and so great was the heat from it, that it was felt that Mr. E. E. Rudge, Chief Coke Manager of the Company, was on safe ground when he said that he believed the grate presented the solution of the smokeless fuel problem for open fires using ordinary gas coke.

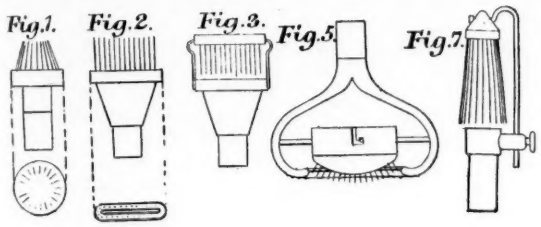
The grate has a good appearance; and, in fact, those people who like to have something in their households different from their neighbours will find in the design of the grate points that are uncommon. The grate itself stands well out from the front plate. The bars are curved at the bottom; and the fire-brick back inclines outwards from bottom to top—thus causing the heat to be largely projected towards the floor of the room in which the grate is used. But a very important feature of the grate is the means of regulating the combustion. The front is fitted with a sliding shutter, which, whether up or down, has nothing about it that is unsightly—in fact, when the shutter is up, the small protruding part looks like part of the design, and at the same time serves a useful purpose; when down, it induces such a rapid draught that the fuel is quickly raised to a state of high incandescence. The

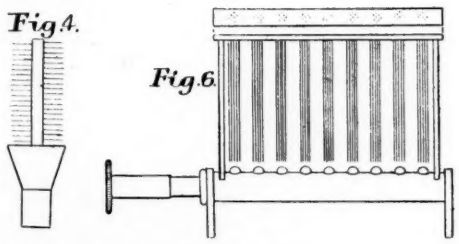
shutter simply consists of a cast-iron panel, with a shallow canopy attached. After lighting the fire, the shutter is lowered; and when the fire has been burning a few minutes, the shutter can be raised, and placed in the ordinary position. Unless the fire is allowed to get very low indeed, there is no need to again drop the shutter, even when adding fuel. The construction of the shutter is such that, when raised, no fumes can get into the room. The special construction is accompanied by various designs of ornamental work and good clean workmanship; and the fire is therefore suitable for any situation in a house. Nothing more can be desired than the good deep incandescent body of fuel, the radiant heat, and the cheerfulness of this fire, which, at the same time, maintains the ventilating effect of the present open fire. The fire will light without coal; and the user has, through the draught created by the shutter, no more trouble than he experiences with the open coal fire—in fact, it lessens the labour. A little raking out of the bars occasionally is sufficient; and there is no smoke or dust, and merely a little ash in the pan below. The saving that there is to be made out of a grate of this kind would recoup a householder the expense he would incur in pulling out an ordinary fire grate, and replacing it by one of these. What is more, the same grate will burn coal as well as coke.

Enough has been said to show that our inspection of the new open-fire coke grate in use at the Horseferry Road offices of the Gaslight and Coke Company has won for it our complete approval and admiration; and we believe it will be immediately welcomed in the show-rooms of many other gas undertakings who desire to cultivate a larger trade in coke for domestic purposes.

FILAMENTS FOR GAS OR ELECTRIC LIGHTING.

A patent has been taken out by MM. Michaud et Delasson for the manufacture of filaments for use in lighting by gas or electricity. When the filament is intended for use with the latter in free air, it is composed of a radiant non-conducting envelope and a conducting thread; when intended for gas or similar illuminants, it consists of the radiant portion only, which is precisely the same for the two kinds of filaments. This consists of alumina, magnesia, silica, or lime, melted and employed together or separately with the previous addition of thorium, cerium, or any other of the oxides of the rare earths. The substances selected are agglomerated with soft soap. The conducting portion will be either carbon of sugar, or vanadium, tantalum, osmium, or any other metals or oxides of the metals of this group, with the addition of soft soap to bind them together.





The following is given by the patentees as an example of a filament to be used with electricity: Thorium, 99 parts; cerium, 1 part, with traces of chrome. Of this mixture 80 parts by weight are combined with 20 parts of pure aluminium, and then bound together with soft soap. For the conducting thread, carbon of sugar and soft soap are employed. The composition of the filament employed for gas, petroleum, acetylene, lusol, &c., is exactly the same as in the other case, with the exception of the conducting portion. For the bodies named above, by way of example, may be substituted one of the others enumerated. The filaments are manufactured by placing the constituent materials in tubes, whence a specially constructed press forces them into an infusible vertical channel traversing an electric furnace and ending in a reservoir in which, after fusion, the filament is automatically cut into the desired length. By modifying the shape of the orifice of a tube and of its central rod, by which the filament is caused to take a tubular form, it is possible to make it any shape or size.

The illustrations show how the filaments may be applied for lighting and heating by gas or electricity. Fig. 1 shows a conical mantle fixed by its base; figs. 2 and 3, a flat mantle similarly fixed, and one suspended; fig. 4, a series of superposed horizontal threads with central support; fig. 5, a circular mantle for an inverted burner; fig. 6, a radiator; and fig. 7, a conical mantle.

MORE OF THE MANCHESTER EXHIBITION.

Cookery Lectures and Competitions.

Mrs. E. Middleton, in the cookery lectures, demonstrations, and competitions, is scoring success all along the line. If we say that in the evenings, the lecture-room has been crowded during the demonstrations, and in the afternoon the room has been well filled, the truth is told. It is difficult to pick out one event from the others for distinction of special reference. But the success was undoubtedly striking of a high-class dinner last Thursday afternoon, with simple table decorations. It was a great hit in connection with the latter, in view of the visit to this country of the Spanish Royal Family, to have adopted the Spanish colours—red and yellow. In flowers and ribbons, the colours were entwined gracefully on the table; and the colours were also incorporated as far as possible in the different dishes cooked.

The girls' cookery competitions are, as they were at Earl's Court, a great attraction; and the work done by the cooks in embryo is really wonderful, gains admiration, and speaks volumes for the instruction of their teachers and the aptness of the girls in the work. Only Tuesday and Thursday were lacking in these competitions; and on the other days of the week, the girls received the greatest encouragement from the audiences. The last of the series of competitions was held yesterday; and it is expected that an announcement of the names of the winners of the gold and silver medals will be made to-day or to-morrow. All competitors are to receive certificates of merit.

Visit of Midland Association Members.

It will be remembered that, at the recent meeting of the Midland Association of Gas Managers, the question of formally visiting the Manchester Exhibition was discussed; but it was found impossible to arrange a set excursion. Nov. 1, however, was chosen as a day that it was thought would be convenient for several of the members to visit the Exhibition. In the event the day was convenient to but few; and prior to it therefore members have taken opportunities for paying a visit, and others, including the Secretary (Mr. Charles Meiklejohn), will doubtless do so during this week. The members the President (Mr. Hubert Pooley, of Stafford) met at the Exhibition on Friday were: Mr. H. E. Copp, of West Bromwich; Mr. W. Langford, of Longton; Mr. C. H. Webb, of Stourbridge; Mr. A. T. Harris, of Market Harborough; Mr. W. J. R. Baker, of Great Malvern; Mr. W. Townsend, of Hereford; Mr. W. H. Adams, of Bilston; Mr. J. C. Bennett, of Bridgenorth; and Mr. H. Haddock, of Atherstone. Mr. S. Meunier (of Stockport) offered to show the members on Saturday his new inclined retort installation—an offer highly appreciated.

THE AMERICAN GAS INSTITUTE.

Second Annual Meeting.

The Second Annual Meeting of the American Gas Institute was opened in Washington (D.C.) on the 16th ult., under the presidency of Mr. Walton Clark, of Philadelphia. We learn from an epitome of the proceedings in the last number of the "American Gaslight Journal" to hand, that members were present from every section of the States and Canada; while foreign lands were represented by a visitor from Brazil, in the person of Dr. Morpurgo, the Inspector of Public Lighting for Rio de Janeiro.

On the members assembling about ten o'clock, there was introduced to them the Hon. H. B. T. MacFarland, the President of the Board of Commissioners for the District of Columbia, who offered a few words of welcome to the Association, which were duly acknowledged by Captain W. E. M'Kay. The President then delivered his Inaugural Address, in which he dwelt upon many things of vital moment to the gas industry of America, referring particularly to the attitude to be maintained by it towards the encroachments of the Legislatures, many marked examples of which in the past year were mentioned, prominent among them being New York and Wisconsin. The address was regarded as, on the whole, an excellent one; and it was, as usual, referred to a Committee. Then followed the report of the Board of Directors, which embodied the reports of the Secretary and Treasurer. The former was a long and most important document, containing recommendations of a nature to cause notable changes in the active working of the Institute. Prominent among them were the suggestions that the two offices named should be combined, that Committees on Technics and on Public Relations should be nominated; and it was mentioned that permanent head-quarters for the Institute had been secured at the Engineering Societies' Building in New York. The reports were adopted in their entirety; and they were followed by one presented by Mr. A. E. Forstall, the Secretary of the Gas Educational Fund of the Institute. It showed that the excellent results already achieved were being maintained and even improved upon. Another feature of the morning sitting was the announcement that the accessions to the membership of the Institute during the year had been about 150; bringing up the total to 1222. The routine business having been disposed of, the members turned their attention to technical matters; the subject submitted for their consideration being the

"Obligations Imposed by the Possession of a Franchise." It was introduced in an address by Mr. Charles H. Dickey, of Baltimore, who handled his theme vigorously; and his conclusions were received with applause.

In the afternoon, the proceedings were opened with a discussion on Mr. Dickey's communication. Next came a paper on "Depreciation," by Dr. A. C. Humphreys, which was a masterly and exhaustive presentation of the subject. It was followed by one by Mr. W. H. Gardiner on "Uniform Accounting and Depreciation," emanating from the Special Committee of the New England Association on the subject. The two papers were taken together, and discussed at considerable length; one of the speakers being Mr. Forrest E. Barker, the Chairman of the Massachusetts Board of Gas and Electric Light Commissioners. The reading and discussion of these papers occupied so much time, that two papers had to be deferred till the next morning.

The proceedings on the second day of the meeting opened with a consideration of the contributions to the "Wrinkle" Department, which were handed in by the Editor, Mr. Milan R. Bump. The budget was accepted, and the members in charge of this department of the Institute's work were complimented upon it and asked to continue their labours. That these have been productive of good fruit is shown by the fact that this year's budget contained 76 "wrinkles." The next business was the presentation by Mr. W. H. Gartley of the report of the Committee on "Methods of Taking Candle Power"—a long and well-arranged statement, but, as we gather, somewhat disappointing as to its recommendations. This was followed by the submission of the report on the President's Address, which gave rise to a few remarks. The election of officers was then proceeded with, and it was decided to take a ballot on the filling of the principal positions.

The afternoon session was opened with the announcement of the result of the ballot, which was as follows:—

President.—Dr. A. C. Humphreys, of New York.

First Vice-President.—Mr. H. L. Doherty, of Madison (Wis.).

Second Vice-President.—Mr. W. A. Baehr, of St. Louis (Mo.).

The discussion of the report on "Methods of Taking Candle Power" was proceeded with, and it included a communication from the Illuminating Engineering Society, which was referred to the Technical Committee. The reports of the Committee on "The Making of Rates and an Additional System of Costs" and the Public Policy Committee were handed in by Mr. W. H. Gardiner, jun. These having been considered, the latter Committee were discharged and their duties assigned to the new Committee on "Public Relations." Members next listened to a lecture by Professor A. F. Ganz, of the Stevens Institute of Technology, on "Electrolysis," who, we learn, said more practical things on the subject during his brief discourse than have ever been stated at a public meeting of a body of gas engineers. The lecture was appropriately followed by the presentation by Mr. A. G. Glasgow of the report of the Institute's Committee on Electrolysis; whereupon an interesting debate took place, which ended in the passing of a vote of thanks to the lecturer.

The remaining business was disposed of next day; and the meeting, in connection with which there were the customary social functions, was brought to a close.

THE "NULITE" LAMP.

Messrs. J. & W. B. Smith's New Show-Rooms.

In the making of new incandescent gas-lamps, there is no end; and for this condition of things we are not sorry, as it is an earnest of the desire of makers to continue to pursue improvement to its unknown end. In designing the "Nulite" inverted lamp, Messrs. J. & W. B. Smith have had in view a high-class, high-power lamp at a moderate cost, which shall have a good scope for application. If the illustration is examined, it will be perceived that there is an outer casing, an inner chimney, an inner glass covering the mantle, and a globe without any bottom air-inlets. These points being noted, it will be easy to follow the objects that have been aimed at in designing the lamp. The gas enters at the top, descends the arm, on which is shown the gas-injector with its special adjuster, and passes down the bunsen, which is carried between the outer casing and the inner chimney, making towards the bottom a right-angled turn into the inner chimney, centrally situated, in which is a mixing chamber of special construction. Internally this chamber has a dome-shaped top and a cone-shaped bottom, in which is a gauze disc that can be easily renewed. On the lower part of the cone-fashioned bottom of the mixing-chamber, some supports are provided for the mantle, which may be of ordinary make. It will be seen that the mixing chamber is directly in the path of the products of combustion, so that the gas and air mixture must become highly heated before reaching the point of combustion. Other features are that the products of combustion are dispersed through several openings in the top of the central chimney (which, by the way, is white enamelled outside), and that the inlets in the bunsen for the primary-air supply are below these exit-holes for the products of combustion, so that there is no possibility of the latter vitiating the primary air. Then with regard to the secondary air supply, the inner glass (which is attached to the inner chimney by a bayonet joint) is slightly bell-mouthed. This being so, the secondary air supply entering through the openings in the outer casing is, in its descent, directed by the slightly curved inner glass outwards, and thus the incoming current of air in its travel becomes heated, and has no cooling influence upon the mantle. The inner glass and the chimney also serve to create greater rapidity of the current of hot air over the surface of the mantle, and so intensify its incandescence. The lamp is of good appearance, is made of stout metal, the combination complete is very cheap, singly or in clusters it looks all that it is claimed to be, and for shops, show-rooms, halls, factories, and so forth, it will answer well. The light is intense; and with an opaque globe, the lamp gives an excellent body of light.

"Nulite" Lamp.

With reference to the lighting efficiency of the lamp, Mr. C. G. Brett has tested it photometrically, and his report on the subject is as follows:—

Regarding the lighting efficiency of your "Nulite" lamp, I have now, as requested by you, made careful photometrical tests of same, and find that its efficiency is about 25 candles per cubic foot. I give below two of a series of tests made in our laboratory, and carefully checked by myself and my assistant—

Pressure.	Consumption. Cubic Feet.	Candle Power.	Candle Power per Cubic Foot.
38° below horizontal—			
14-10ths ..	2·80 ..	71·0 ..	25·3
20-10ths ..	3·75 ..	93·4 ..	24·9
Horizontal test—			
20-10ths ..	3·75 ..	87·5 ..	23·2

With regard to the above figures, it was, of course, necessary to adjust the regulating-nipple carefully at each pressure in order to get the best result; but I consider the ordinary stock mantle is rather too short to give the highest result with this lamp, and think from observation that, if the mantle had been at least ½ inch longer, still higher readings would have been obtained. The readings were, of course, taken through clear glass outside globe. You will note there is a slight rise in candle power with readings below the horizontal line, and especially when the angle of the reading just clears the bottom of the inner cylinder, so that the reading is only taken through one thickness of glass. I used a Simmance and Abady "Flicker" photometer with the 10-candle Harcourt pentane standard, and checked the results by a "Weber" photometer; the latter instrument being one I have continually used for a long time past, and am therefore confident that the results are correct.

When calling to inspect the "Nulite" lamp at Messrs. J. & W. B. Smith's premises in Farringdon Road, it was noticed that the firm have had to annex the adjoining premises, in order to secure the accommodation necessary for their flourishing trade in incandescent lamps and fittings of all kinds. The most attractive part of the extension is the splendid show-room they have thus secured, which, on all points—size, equipment, and convenience—completely dwarfs the old show-room, which is now relegated to the inferior position of an adjunct to the new room. Its dimensions will be better appreciated by saying that its superficial area is 66 ft. by 18 ft. The place looks not only pretty but handsome. Mirror panels are fitted into the walls. Circular tables are down the centre for the display of small fittings and incandescent accessories. Depending from the ceiling are pendants of all descriptions, and, it is evident, of the best quality and workmanship. There are pendants for large and small inverted burners and pendants for vertical burners, single or clusters. There are fixed pendants; and rising and falling pendants. There are plain and highly decorated pendants, including the (according to the current vogue) inevitable Adam style, which is, to say the least, a very pleasing embellishment in incandescent fittings. Novelties are the harp shape pendants made for either inverted or vertical burners, according to choice. On the walls are brackets of all sorts and conditions; and many of the remarks made concerning the pendants apply equally to these. In glassware, the display speaks of careful selection and good judgment, both from the artistic and useful points of view. When we look round, it is not surprising to find that inverted fittings predominate, and inquiry elicits the information that business has taken a very decided course in this direction. At night time, when the show-room is lighted up, it is very attractive. The new premises have allowed the extension of the offices; and a plate-glass department has also been added. The firm are to be congratulated upon this enlargement of the conveniences for their customers and for the prosecution of their up-to-date business.

UNITED MEETING OF ENGLISH JUNIOR GAS ASSOCIATIONS.

A Successful Gathering in Manchester.

It was a happy thought that prompted the Advisory Committee of the Manchester Gas Exhibition to make one of the Saturdays on which it was open a "Juniors' Day," and to invite the members of the Junior Associations to choose that day for a collective visit. The Manchester and District Junior Association eagerly adopted the suggestion, and the officials and many of the private members worked hard in making all necessary arrangements. No hosts could have been more thoughtful and assiduous in their attentions to their guests; and they must have been richly repaid by seeing the entire success that crowned their efforts. The day had been anticipated with much interest; and all expectations were surpassed. The Manchester and District and the Yorkshire Associations seemed to have put in an appearance *en bloc;* at least 100 members of the Midland Association were present; and about 36 made the long journey from London. Only distance prevented the Scotch Associations from accepting the invitations extended to them; but they were at least represented, and so in a measure participated in what was a memorable day, and will hereafter be regarded as an historic occasion. The event is a striking example of how the Senior Associations and their individual members can help the Junior Associations; and the absence of the Lancashire and Yorkshire Engineers and Managers on Saturday was in itself interpreted and appreciated as a warm assurance of sympathy and kindly helpfulness, inasmuch as it meant that they remained at home in touch with their works, in order to let their assistants and other employees attend.

The "gathering of the clans" touched the imagination and fired the enthusiasm of all who were present, and of none more so than those who are closest in touch with recent movements among our young men, and most familiar with their gatherings and the *personnel* of their members. The title of "juniors" may to some call up the sight only of young men in their teens; and to any such the gathering that Mr. Newbigging faced on Saturday would have come as a revelation not unmingled with surprise. Young "juniors" were there, of course, and in no small numbers; but the Associations would have been but weakly, and perhaps died of inanition ere now, had not the upper ranks of the "juniors"—in years as well as professional standing—rallied to the movement and loyally and unselfishly devoted themselves to the interests of the more youthful and less advanced members. Known to each other, and distinguished by rosettes and ribbons of various colours, the members fraternized most cordially, and on this occasion at least belied the common estimate of English insularity and cold aloofness. Many long-anticipated acquaintances were made of those who knew one another well by name and reputation, and through the medium of the Press; and many confidences were exchanged, views were explained, and plans were discussed. Probably thus much lasting good results to individuals, to Associations, and to the movement as a whole, by these informal and busy little conferences. Everyone (and especially the local men and the officials of the various Associations) was solicitous about everyone else's pleasure and profit; and cordiality and enthusiasm grew as the hours passed by.

At the joint meeting held in the afternoon, Mr. Newbigging, who welcomed the visitors in the name of the Advisory Committee, rightly said that one most prominent exhibit that day was enthusiasm. In no respect was this more noticeable than in the reception given to the venerable speaker. Even apart from his position as Chairman of the Advisory Committee, no more suitable selection could have been made; and to many one of the most anticipated pleasures of the day was the privilege of seeing and hearing one whose name to all gas students is a household word. Quite impressive was the respect shown him—respect akin to love and reverence—especially when, greeting his auditors as "fellow-students," he proceeded to speak of the humility characterizing men of truly great achievements, and of their sense of the disproportion between what they had learned and done compared with what remained to be learned and done, and even with what they might have accomplished. The words of encouragement, appreciation, and stimulus he spoke to them, both as individuals and Associations, will be as surely remembered as will be the sight of the veteran teacher, leader, and expert warming up to quite astonishing vigour and emphasis, as though feeling the inspiration of the presence of so many "men of to-morrow." For, as he said, there would evidently be no dearth of gas managers for one generation at least. Probably of set purpose, and, if so, wisely, no attempt was made formally, or even by suggestion, in the subsequent speeches to indicate further developments of the Association movement, or to discuss the relation of various Gas Associations to each other. The best results of the gathering will be those that will gradually ensue from the quickening of interest and enthusiasm, from the recognition of how much more the movement means than can be seen in any one sectional gathering, from the growing assurance that great possibilities of usefulness may yet be utilized, from the more intimate and accurate knowledge of the conditions, aims, and working of the sister Associations, and from the many busy informal talks among those who have taken the chief share in the work hitherto. A combined meeting of the Councils of the four Junior Associations was held during the afternoon; so that now inter-communication is assured, and combined action and mutual assistance rendered the more easy and probable.

The present condition of the Junior Gas Association movement is the outcome of typically English methods. Like the English Constitution, they have gradually grown up and developed—not, perhaps, exactly as any would have foreseen or planned, certainly not in uniform ways or under uniform conditions. But originating under the pressure of a felt need, and working out their own development as ways suggested themselves, and as the individualities of their early leaders prompted, they have, as Mr. Newbigging remarked, justified their existence. Judging from the experience so far gained, and from the work so far accomplished, the gas industry looks forward with confidence to the future of these Associations worked on lines similar to those along which progress has already been made. The movement has been fortunate in the leaders it has so far had, in their active zeal, their discretion and judgment, and their powers of initiation and organization; and such co-operation among the Associations as may be found possible and advisable in the future should result even more markedly in wise arrangement, and guidance and successful issues. Let all remember that seniors are seniors and juniors juniors; the Associations each having its own special place and work. Business methods and results, commercial considerations and organization, collective action for the industry as a whole, must remain in the proper realm of the seniors; while the development of their own professional equipment and education, and the securing of such privileges as visits to works, lectures, &c., which could hardly be secured by individuals, present a great scope and yet undeveloped possibilities that will find vent for much energy and ingenuity on the part of the juniors. No trades union development, no mutual material enrichment organization, nor even the public defence of the industry or the advancement of its claims on the community is necessary or even advisable as a feature of Junior Association work, but a sensible realization of its most useful and indisputable sphere of influence, and a readiness to utilize and even to search for opportunity of natural development in that sphere. Their native good sense and the forethought of their leaders have avoided so far many of the perils of a new movement. The future is bright with promise, and last Saturday's gathering adds assurance to our hope of that future.

The arrangements that had been made for the United Meeting of the English Junior Gas Associations in Manchester last Saturday, in connection with the Gas Exhibition, proved to have been admirable in every respect; and throughout the day everything went off, not only without a hitch, but positively with a "bang." For this, of course, thanks are due in various quarters; as the making and carrying out of plans in connection with a meeting of juniors from Yorkshire, Manchester, the Midlands, and even so far afield as London, and which it was anticipated would be—and, in fact, actually was—attended by probably somewhere in the region of 250 persons, was clearly an undertaking of considerable proportions. Certainly, the Entertaining Committee (which consisted of the Council of the Manchester and District Junior Gas Association) left nothing undone that could in any way conduce to the comfort or enlightenment of the visitors—a statement which also applies to the Advisory Committee of

the Gas Exhibition, while the Secretaries of the various Associations all did their part of the work well. The London contingent, considering the great distance, and the somewhat awkward hours of travelling, was an excellent one; and the securing of a party of some 36 to leave St. Pancras about midnight on Friday was an achievement which speaks well for the London and Southern District Junior Association, and for the confidence felt by the members that the arrangements for the excursion, which had been left with Mr. H. Rothwell, were in capable hands, and that the maximum of comfort would be secured. This confidence proved to be not misplaced; and it was a cheerful band who walked through the streets at about 5.30 on Saturday morning (incidentally admiring the public lamps that were then alight) from the station to the New Shades Restaurant in Church Street which was to be the headquarters for the day. At 6.30 breakfast was served; and here it is no more than fair to remark that the whole of the catering was done in excellent style. At this meal the London contingent was swelled by Mr. R. H. Garlick, the Treasurer, Mr. A. L. Holton, the Secretary, and Mr. F. Thorp, a Member of the Council of the Manchester Junior Association, and they were soon followed by two other Members of the Council —Mr. J. Taylor and Mr. D. V. Hollingworth. At this point, the day may be said to have begun for the Londoners—although exactly when the preceding day left off, would perhaps not be quite so easy to determine.

A Round of Visits.

At about 7.30 conveyances were in readiness to drive the party to the Barton Aqueduct on the Manchester Ship Canal, which is a somewhat remarkable piece of engineering. Just at this particular point the Manchester Ship Canal is crossed by the Bridgwater Canal, close to which is also a traffic bridge. To enable the large vessels to pass along the Manchester Canal (which will take ships up to 12,000 tons), the portion of the Bridgwater Canal which is above it is arranged as a swing bridge; and by means of hydraulic machinery, the water, boats, or anything else happening to be on it at the moment are moved on one side—the water being, of course, cut off at either end. The huge weight of some 1400 tons—600 tons of water, and 800 tons of steel—spread over a length of 234 feet, a breadth of 19 ft. 6 in., and a depth of water of 6 ft. 6 in., swings on one centre pivot. The traffic bridge is moved in a similar manner. Fortunately, just as the visitors arrived a large vessel was waiting in the Ship Canal to pass (though the Chief Engineer, Mr. Hunter, had promised that in any event the structure should be swung for the edification of the party); and the hydraulic machinery was promptly set in motion, the visitors meanwhile remaining standing on the canal bridge. The operation completed, and *terra firma* being reached again, a vote of thanks to Mr. Hunter was passed on the proposition of Mr. W. Upton, the President of the London and Southern District Junior Association, seconded by Mr. Rothwell. Mr. Thorp, in supporting, pointed out that their thanks were particularly due to Mr. Hunter, inasmuch as the promise to swing the bridge, whether or not a ship happened to be waiting, was in reality a great concession.

The conveyances were then again requisitioned, and after passing through the Trafford Park Estate, a halt was made at the handsome show-rooms of Messrs. Fletcher, Russell, and Co., situated in Deansgate. Here a warm welcome was extended by Mr. Alexander Russell, Managing-Director, Mr. Willie Russell, jun., a Director, and Mr. G. Hurst; and at the conclusion of the inspection (unfortunately necessarily somewhat hurried) light refreshments were dispensed. The show-rooms extend over four floors and a basement; and in the large area thus available there is ample room for an effective display of all the firm's well-known lines—furnaces, gas-fires, cookers, laboratory appliances, iron and wood mantelpieces, tiling, grates, &c. In fact, the display of mantelpieces and tiling especially is most attractive; and the many beautiful designs exhibited were greatly admired. In proof of this, it may be mentioned that the firm claim to have the finest show of these goods to be seen in any part of the country. Before leaving, Mr. Upton suitably thanked Messrs. Fletcher, Russell, and Co. for their kindness.

From this point, the drive was continued to the gas engineering works of Messrs. R. & J. Dempster, at Newton Heath, over which the party were shown by Messrs. H. S. Knight, G. F. H. Beard, J. W. Scott, Peaty, A. G. Buckler, Wright, and Halliwell. It is needless to say that the visitors found here numberless objects of interest; the many large machine tools being carefully inspected and their purposes explained. In addition to the plate cutting, bending, and punching machines, &c., more than one big spiral-guided gasholder was seen in process of construction; and there were also compressed air and hydraulic riveting machines in operation. The visitors were introduced to the first Dellwik plant put up in England, which is engaged in turning out gas for use on the works. For the purposes for which the gas is required there, a large percentage of carbonic acid—as much as 12 per cent.—is aimed at, in order to dilute the gas, which is suitable for any type of engine, provided the compression is not too high. As the result of their experience, the firm find that for every 100 cubic feet of coal gas, they take about 175 feet of blue water gas, which costs something like 5d. per 1000 cubic feet for labour and fuel, exclusive of depreciation, &c. They can develop the same power with water gas as with coal gas by using more gas, and consequently getting more explosions; but, of course, if an engine is working up to its maximum power, it is possible to do better with coal gas. Provided, however, there is a good margin, the one gas is found to do as well as the other. At the close of the inspection, Mr. T. E. Priestman invited the party to take refreshment. On the proposition of Mr. Hollingworth (who remarked that young men in the gas profession had already had many occasions to thank Messrs. R. & J. Dempster), seconded by Mr. Holton, and supported by Mr. W. Cranfield (on behalf of the Yorkshire Junior Association), and Mr. Upton, a cordial vote of thanks to the firm was passed, and was acknowledged by Mr. Priestman, who expressed the hope that on some future occasion the members would come again and spend a longer time at the works.

A return by special car was then made to the restaurant, where (the numbers having by this time been largely swelled) over 120 sat down to dinner; while at the subsequent tea there were nearly 230 present. In the early afternoon, there was a Joint Council meeting of the different Associations; and later on the united gathering took place at the Gas Exhibition, of which a report appears below.

The Meeting.

The united gathering took place in the afternoon in the Lecture Hall at the Exhibition; the chair being occupied by Mr. E. J. Wellens, the President of the Manchester and District Junior Gas Association. There were probably more than 250 members present. Before settling down to the business of the meeting,

Mr. A. L. Holton, the Hon. Secretary of the Manchester Junior Association, remarked that at a meeeting of all the English Junior Gas Associations, it was only right to say a few words about the other two Associations, the inclusion of which would have made the meeting British. The Eastern Division of the Scottish Junior Gas Association would have liked to have been present; but they felt the distance would have been an obstacle. The same remark applied to the Western Division; but he was pleased to be able to announce that the ex-President of the Western Division had seen his way to be present.

The Chairman said the next thing was to introduce to the members their esteemed friend, Mr. Thomas Newbigging.

Mr. Newbigging, whose rising was the signal for loud and prolonged applause, then addressed the meeting in the following terms.

Mr. Chairman and Fellow-Students,—On behalf of the Advisory Committee of the Exhibition, I desire to say that we are all glad to see the Junior Gas Associations throughout the country so numerously represented here to-day. And on their behalf, also, I have the utmost pleasure in giving you a hearty welcome to Manchester and to the Exhibition. We look especially to our rising aspirants—particularly the younger ones—to the position of gas engineers and managers for maintaining the better traditions of our important industry. Young though many or most of you are, the responsibility resting on you is very great. The older men must soon quit the stage. Some of us, less or more, during a lengthy span of life have striven, with such power as we possessed, and I hope not unsuccessfully, to maintain a high standard in the profession. It is for you to emulate those examples in so far as you find them worthy of imitation, and at the same time to better the examples where you have found them deficient. Again, much is expected of you, inasmuch as you start on your tasks from a higher vantage-ground than your predecessors of the present generation. Looking at your various proceedings, as reported in the Technical Press, I hold that you have justified your existence as Associations. This is all the more creditable seeing that you have only come into being within the last few years. At the same time, I have no desire to flatter you, and tell you what geniuses you are. That would be a poor return for your coming and meeting here to-day. I know that you would resent me doing that. You would treat my words with contempt if I tried any such flattery. The wisest men know their shortcomings. Lord Kelvin, when at the very zenith of his fame—and we rejoice that he is still with us—once said: "There is one word which characterizes all my efforts for the advancement of Science, and that word is 'failure.'" Now, we know what Lord Kelvin meant by that expression. His contributions to Science were not failures in the ordinary acceptation of that term. What he meant, as I apprehend, was something like this: Most that we undertake is, comparatively speaking, failure, in presence of our lack of knowledge of the unexplored regions of discovery that still remain; and that no great achievement is ever reached without some initial failures. Humility, then, is one of the virtues which, among the rest, we do well to cultivate—not the "Uriah Heap" kind of humility, but the genuine humility which is born of the knowledge of how little we know, let our achievements be what they may, but which also stimulates us to make further advances. In another sense there is no such word as "failure" for the man who determines, I will not say to succeed, but who determines to excel. One may succeed by hook or by crook; but that is not the true success. To excel is to succeed even if we seem to fail. And what facilities there are for study nowadays! Technical schools and colleges abound. There is no room for dominoes and cards in the *curriculum* of the earnest student—no room for trifles like these. A friend of mine remarked to me the other day, when he heard of your intention to hold this meeting, that there was not likely to be any shortage of gas managers for one generation at least. Well, if that be so, and I, too, believe it to be the fact, it is a good omen for the gas industry —a good sign that so many young men of vigorous mind are

sedulously qualifying themselves for taking a leading and honourable part in its advancement. The worth of an exhibition such as this consists largely in the facilities it offers to each of us for gaining a knowledge of the best that has been attained in its several departments. One may read about a thing with a full understanding of one's reading; but when the object is presented before our very eyes, the educational value is greatly enhanced. There is one exhibit in the Exhibition which is prominent to most observers, and that exhibit is *enthusiasm*. I have noticed that every day. Perhaps it is one of the most important of all the exhibits. You are contributing to this enthusiasm by your presence here to-day. If it had accomplished no other thing than bringing you together on this occasion, the Exhibition has proved its usefulness. One word more, and I have done. I take the opportunity of mentioning, though you probably all know, that the City and Guilds Examinations take place in the month of April or thereabouts, and that for the first time the subjects of Gas Manufacture and Distribution will be taken separately. Our friend Mr. J. H. Brearley is the Examiner in Distribution, and has advocated the separation of the two subjects; and he is naturally desirous that this special branch should attract a good muster of students. I am not aware that any classes have been formed for instruction in the Distribution branch; but there are the text-books, and, better still, you have your own daily practical experience to enable you to enter the lists. And now, wishing you every success, I leave you to transact your own special business, and with the expression of the hope that you will find much to interest you in the present Exhibition. (Applause.)

Mr. W. Upton, the President of the London and Southern District Junior Gas Association, who was next called upon by the Chairman, said it was with great pleasure he found himself there that day representing his Association. When he recollected the very few years that had elapsed since the formation of these Junior Associations, and the trials and troubles incident to their inception, and now looked round and noted to what the original idea had expanded, he felt convinced that there was a distinct call for these Associations. Their *raison d'être* lay undoubtedly in the fact that it had been found necessary and desirable to have the opportunity of exchanging ideas and experiences with others, in order that their knowledge of the business to which they had applied themselves might be increased; and so long as this was efficiently performed, there was not the slightest doubt that they would prove a great success. The tendency of the age was in the direction of specialization and a general "speeding up;" and if they were to keep their position, both personally and professionally, they must be prepared to seize upon all information that might be of service to them. The business of gas supply, having lain practically dormant for a considerable number of years, was now waking up to a realization of its position and opportunities; and under the stress of many forms of competition, it was making an active bid for the field of work to which it appeared to be specially fitted—such as lighting, power, and heating. The hitherto, to a considerable extent, latent energies of the business were being vigorously developed; and, as a consequence, there was becoming evident an increasing call for capable men. He was sure that, in these days of commercial methods, a man who exhibited the right qualities would have no just cause of complaint as regarded the financial recognition of his services. These were the days of transition in many businesses, but in none more so than in the business with which they were connected. At no previous time had it been so necessary to be *au fait* with the trend of invention as was the case at present; for upon the proper understanding of the requirements of the day their future largely depended. To those connected with the manufacturing side of the business were being constantly presented new methods of handling raw materials, new systems of carbonizing with the consequent new plant, new qualities of gas, until they reached what should be the perfection of their process—the transmuting, not of about 15 per cent. of their raw material into the finished product as at present, but 100 per cent., less the incombustible content—for the present small percentage of conversion, he thought they would allow, anyway as a proposition, was far from perfection. To those connected with the distribution side of the business, there was the problem of bringing the consumption of gas in their districts up to saturation point—a point from which they were far removed at the present—and this process would most probably entail entirely new ideas of gas distribution, both as to joints and mains. There were the problems of efficient lighting of districts a few miles outside the usually considered limits of a distribution system; the great problems of efficient lighting, both interior and exterior, for the demand was still for light and yet more light; and the greatest problem, common to all, how to do it at a price at which they could meet competition—for competition would follow them all along the line, new as that line might be. There was not the slightest doubt in his mind that, great as was the gas business to-day, it would yet be immeasurably greater in the near future; and to those who were now juniors would fall their share of the solving of the many new problems that would await them, no matter what their department might be. It was clearly seen, then, that as progress was inevitably the order of the day, it really behoved them all to be careful that they were in such a position as regarded equipment that they might take their fair share of the work, and, through such work, that they might obtain what they all desired—material advantage. The work of efficiently conducting the Junior Associations was far from light; but he was sure that the various Councils felt fully recompensed so long as they saw the members display that active and intelligent appreciation of the undoubted valuable fare laid before them that had of late been manifested. He sincerely hoped that this happy occasion of their first united meeting—the first "gathering of the clans"—might lead to others, and to a strengthening of their endeavours, and a valuable interchange of ideas. The members of his Association had come up from the South to see the Gas Exhibition; and everyone seemed to be exceedingly pleased with it. Of course, they had a comparison in the Earl's Court Exhibition; but he thought that in Manchester they had, if anything, "gone one better." Progress was most evident, and had been keenly noted certainly by the members of his own Association whose opinions he had so far ascertained. He was sure that nothing but good would result from this meeting. The Junior Associations, he felt confident, had come to stay; but it rested entirely with the members to decide what amount of good they would be able to do. As one of the seniors had remarked to him a few days previously, "Your salvation lies in your own hands."

Mr. W. E. Caton, the President of the Midland Junior Gas Engineering Association, said that, on behalf of his Association, he wished to state how pleased they were to have Mr. Newbigging with them. By way of a commencement, he would like to say a few words on the formation of the Midland Junior Association. It was formed three years ago, at the instigation of Mr. Thomas Berridge, of Leamington, who was then President of the Midland Senior Association. He believed they were in the unique position of being the only Junior Association who were officially recognized by the Senior Association. They had two members of the Senior Association—namely, the President and the Secretary—as members of their Council; and therefore they had a guiding hand, so to speak, in all that they did. And the official recognition was carried still further, for the President and Secretary of the Junior Association were in a like manner included in the Council of the Senior Association. He trusted that the present first joint meeting of the various Junior Associations might lead to a permanent bond of union between them, and that the time might not be very far distant when they would have the pleasure of welcoming the different Junior Associations in Birmingham or the immediate vicinity. He felt sure it would be the wish and also the endeavour of every member of the Midland Junior Association to do all in his power to make such a meeting as successful as the present one had been. He did not know that there would be a Gas Exhibition in the Midlands; but anyway they might possibly be able to arrange for a joint meeting, if it met with the approval of the Councils. He need hardly say how pleased they all were with what they had seen in the Exhibition. He did not think any of them need go away with the impression that gas had taken a back place in any way, as the many improvements in the direction of lighting made gas nearly as convenient as electricity at a very much less cost; while as regarded heating and cooking electricity did not stand in the same street with gas. The only other thing he had to say was that the Midland Junior Association were all very pleased with the way in which the Entertaining Committee had catered for their day's outing, and given them the opportunity of meeting the various other Junior Gas Associations.

Mr. J. H. Hill, the President of the Yorkshire Junior Gas Association, in the course of a witty speech which was much enjoyed, remarked that he liked the words "fellow students" used by Mr. Newbigging. It was rather singular that Mr. Newbigging should have advised the cultivation of the virtue of humility, because he (Mr. Hill) had jotted down some points on the subject of pride. In a few words, he wished to foster pride. Mr. Newbigging spoke of enthusiasm. Well, he was sure that this arose from the fact that they were holding up their heads; and thus it was a sign of pride that they were in any way enthusiastic. If they looked up at the roof of the hall, they would see a large circular flat-flame gas-fitting suspended from the centre. Now, they might wonder what it was for; but it was a good thing in its time, though he was not going to ask them to be proud of it to-day. He was, however, going to ask them to be proud of the inverted incandescent gas-burners that were fitted in lamps around the hall. To repeat, he wished to foster pride in their profession. He said "profession," because while they professed to provide light, heat, and power, they often only got credit for supplying an evil-smelling compressible gaseous fluid. A consumer complained to him recently that the gas was bad; and he told him it was owing to faulty pressure. "Pressure," replied the consumer, "you can put on any pressure you like. I do not care about pressure; it is more light I want." He was right. Let them always act up to their profession, and give the thing they professed to give. But they would always, he was afraid, be known simply as "gas men." He spoke one day to an electrician, and said that he had at one time dabbled in that branch; and the electrician said, "Whatever made you forsake electricity and go to gas?" Well, he thought much more of the importance of the mistress he was serving than he did of that of the electrician. It certainly would be nicer to have a more scientific title. Electrician was a name anyone could be proud of. Even the shop-boy who sold electric bulbs called himself an electrician; but they never knew an ironmonger who sold mantles to call himself a gas man. Still, "a rose by any other name would smell as sweet," so let them not be ashamed of their old title, even if it was a misnomer. The late old gas collector of his undertaking (who, though working for a company, always carried his corporation with him), once

brought in a picture from "Punch." Peering behind an office counter was a small boy; and in front of the counter was a portly figure with his rate-book in his hand. The youngster was a little vulgar Yorkshire boy, who was asking, "Are you gas or water, Sir?" It was his (Mr. Hill's) boast that for over forty years he had lived on gas; while his drink had been mostly water. Hence in a sense he claimed to be water gas, with a slight admixture of mineral matter. They might well be proud of gas in these days; proud of the pioneers throughout the last century; proud of the pioneers who were still with them at the beginning of the new century; proud of the progress gas had made in the hands of these pioneers; proud of their present position; proud of the Manchester Gas Exhibition; proud of the numerous University Professors who had helped and were helping them; and proud of their prospects. What would be the state of things in fifty years' time? He hoped and trusted gas would still be leading the way, and that there would be a generation then of gas managers equal to the present generation of rising gas managers. They had a right to be proud of their Associations. He thought they should be proud of the fact that all the Senior Associations were affiliated in one great Association; and they had an especial right to be proud of the Junior Associations. Let them love their calling. He concluded with the following verse:—

"Is there here a man with soul so dead
Who never to himself hath said
'This is my own my well loved light,'
Whose heart hath ne'er within him burned
As to his home his steps have turned
On some cold dismal winter's night
Whilst gas has made his pathway bright?
If such there be, go mark him well,
For him no notes of praise shall swell,
The wretch shall forfeit fair renown,
And doubly dying shall go down
To the vile dust from whence he sprung,
Unwept, unhonoured, and unsung."

Mr. J. MacLeod, ex-President of the Scottish Junior (Western District) Gas Association, said that seeing ladies present at the meeting filled him with considerable fear, because the thought of ladies entering the profession conjured up a horrible picture of the state of order and tidiness they would be expected then to keep their works in. When he entered the hall and saw the Presidents gathered together, he went forward and introduced himself; but he little thought that as a result he would be forced to make a few remarks. He was very much struck with what Mr. Newbigging had said about the attitude of mind they should take up in looking at their profession, especially his remark that they should adopt an attitude of humility—not of the Uriah Heap type, but a proud humility that realized that life was so short that what any one of them could know was very little; that their best and highest efforts were required to keep them abreast of the times, and to go on pushing forward this great industry. Mr. Hill had given them a verse which he (the speaker) felt sure must be causing the shade of Sir Walter Scott very serious uneasiness. He enjoyed the verse very much indeed; but whether Sir Walter enjoyed it in the sphere in which he was, he could not say. He (Mr. MacLeod) looked on this large gathering with the very greatest pleasure. It was such a magnificent meeting, and there were so many energetic looking men present, that one looked forward to the future of the gas industry with the utmost hope and confidence. The encouraging words of Mr. Newbigging would help them on; and he had been delighted to hear probably the most prominent man in the gas industry speaking to them that day.

The Chairman, in proposing a hearty vote of thanks to their esteemed friend Mr. Newbigging, as Chairman of the Advisory Committee, along with his colleagues, for their kindness in allowing the junior organizations to meet in the Exhibition, and for the cordial way in which they had entered into the matter, pointed out that when this general meeting was first mentioned, they did not anticipate that it would have been taken up so unanimously. The result, however, proved the truth of the saying, "Nothing venture, nothing win;" and he was really very pleased to see the gathering had been such a success. He certainly thought they had had a good day; and the kindness that had been shown in granting facilities for the meeting was much appreciated. He also wished to thank Mr. Newbigging for his remarks to them as juniors. Mr. Newbigging called them "fellow students." Well, he was sure they were all proud to know they were fellow students, though most of them, of course, now had higher ambitions. Mr. Newbigging had referred to failure through lack of knowledge This might have happened in the past; but they, as junior members, did not want it to obtain again. The idea of the Junior Associations was to arrange visits so that the members might see what was actually going on in their profession, and, if possible, of course, improve upon it; whereas in the past they had had to depend on Mr. Newbigging's "Handbook," which was known, he should say, to every gas student in the realm. They had had to rely upon this book; and now they wished to make further use of it, by seeing for themselves the apparatus which was so well dealt with in it. He desired to endorse the remarks made by the other Presidents, that it was evident the Junior Associations were filling a long-felt want. It seemed to him only right that this gathering should be held in Manchester. Going back to the formation of what was now the Gas Institution, he was given to understand that it was previously the British Association of Gas Managers. They held their first meeting in Manchester; and they had the honour of having on the platform Mr. Newbigging, who was one of the members present at the original gathering. Also the Manchester district was the first to have a District Association of Gas Managers; and now they had the Joint Conference of the junior organizations, which they were proud to think was being held at the Manchester Gas Exhibition.

Mr. F. Thorp said he esteemed it a special honour to be permitted to second this vote of thanks. The Advisory Committee were very kind to allow them the use of the hall, and also to place the meeting in the Exhibition Guide Book, which seemed to give the Associations a sort of official recognition. At the banquet the other night, Mr. Newbigging had likened himself to an old hunting horse that was in the paddock, and heard the huntsmen and hounds, and wished to join in the hunt again. That there was nothing to prevent Mr. Newbigging going in the hunt, was shown by the way in which he had acted as Chairman of the Advisory Committee of the Exhibition. He had proved that he was still able to give that advice which he had given to the gas industry for so many years past. Their wish was that he might be long spared to continue to give this advice. They should hope in some small way to emulate Mr. Newbigging's example; and their best wish should be that their juniors should think of them in the way in which they themselves thought of Mr. Newbigging. The cordial manner in which the meeting had received Mr. Newbigging and had applauded every mention of his name would be the greatest honour they could possibly do him.

The resolution having been passed with acclamation,

Mr. Newbigging thanked them most heartily for the vote to the Advisory Committee and himself for the facilities they had offered. He could assure those present that when the project was mentioned to the Committee they seized upon the idea with avidity; and they were only too glad to have the Junior Associations among them on this occasion. He was very glad they had been favoured with good weather. Probably some of them had got the idea that the slander was true that there was nothing but wet weather in Manchester. Well, their visit had given the lie to that. Indeed, he noticed that Manchester was comparatively free from wet weather as contrasted with some other parts of the country. He did not like to see Manchester slandered. The Advisory Committee did not need the thanks of the meeting. They thanked the members for coming, and felt they had been honoured by the presence of the Junior Associations there that day. The members must go away with this impression in their minds. He wished Mr. Kendrick would say a word, because he was the moving spirit in this exhibition business.

Mr. H. Kendrick, one of the Joint Secretaries of the Advisory Committee, remarked that he would much prefer to be left in the background. Mr. Newbigging had been flattering enough to say that he (Mr. Kendrick) had been the moving spirit. He was afraid he must return that. If it had not been for the invigorating influence Mr. Newbigging had, not only upon himself and Mr. W. Whatmough (the other Joint Secretary of the Advisory Committee), but upon all the Committee, he was perfectly certain the exhibition they were so proud of would not have had the maximum of influence they hoped it would have, not only in Manchester, but throughout the kingdom. It had just been said that Manchester was a centre from which a good many things had sprung. It had been the centre of the idea that a District Association could run—or at all events promote—a gas exhibition. The benefit which they were all of them perfectly certain it had already been to the industry, should cause other District Associations to follow this example. There was one other thing, which had been mentioned by Mr. W. Doig Gibb, the President of the Institution of Gas Engineers, and which should be brought home to all of them—and this was that an exhibition could not be run by members of the gas manufacturing profession only. If it was to be as successful as the present one had been, they must call in the help of the gas apparatus makers; and he was perfectly certain that a very large proportion of the credit for the success of the Manchester Exhibition had been due to the cordial way in which the makers had worked with them. This had smoothed over difficulties which it would have been very, very hard for them to get over otherwise. Considering there were a number of gentlemen on the Committee with so many divergent interests, every meeting had been carried through with the minimum of friction. In fact, he might say there had been no friction. Nor could an exhibition of this description have been carried through if they had not had behind them the Manchester Corporation Gas Committee, Mr. Alderman Gibson, and Mr. J. G. Newbigging. They all had done a very great amount of work in connection with it; and to the manufacturers in particular and to the Manchester Corporation was due the greater portion of the credit.

This concluded the proceedings of the meeting; and after a photograph had been taken, the members went off to tea, and returned later to complete their inspection of the Exhibition.

A Small Gas-Engine Competition.—In the notice of the prizes offered by the Société Technique du Gaz en France, in connection with next year's congress in Paris, which appeared in the "Journal" for July 16, it was mentioned that particular attention would be given to small gas-engines suitable for domestic purposes. In a special circular which has since been issued, the attention of the members is called to the matter, and their assistance is sought in bringing it under the notice of manufacturers.

MANCHESTER GAS EXHIBITION.

ST. JAMES'S HALL, MANCHESTER.

FROM WEDNESDAY, OCTOBER 23, TO SATURDAY, NOVEMBER 9.

ABSTRACTS OF LECTURES.

On Tuesday, Professor J. B. COHEN, Ph.D., B.Sc., delivered a lecture on

THE SMOKE PROBLEM.

It has always seemed to me a curious circumstance that so much attention is paid to the purity of our drinking water and our food, and so little to that of our atmosphere. Millions are spent in procuring pure water, and considerable sums in support of a staff of inspectors to control our food supply. Yet, according to Professor Foster, an average individual inhales 2600 gallons of air in 24 hours, or about 34 lbs. by weight, as compared with 5½ lbs. of food, liquid and solid, or six times the weight of food. If the food we take is not quite as nourishing or as good as it should be, the digestive process is sufficiently adaptable to select the good and reject the bad. But the lungs are much more delicate in structure and function; and we cannot with impunity inhale a vitiated air and expect our lungs to select the pure and reject the impure, without risk of permanent injury to our breathing apparatus, and consequently to our whole body. It must be remembered also that more than three-quarters of the whole population has drifted into towns—a fact which emphasizes still more the necessity of pure town air.

It occurred to me some time ago that though it was generally recognized that pure air was of the first importance to health, there were no trustworthy data as to the extent of air pollution from smoke, which is the chief source of atmospheric contamination. I therefore devoted some time in trying to ascertain the extent of atmospheric pollution in Leeds, which has had at least one interesting result—namely, that it has demonstrated the possibility of easily controlling air pollution in a way which, by systematic observations, would enable the character of the air to be gauged, and its improvement or deterioration ascertained at intervals with some degree of accuracy.

It has been estimated that in Leeds 4000 tons of coal, on the average, are consumed every working day of the year. I do not know what the ratio of house consumption to factory consumption is; but the amount of soot given off from factory chimneys is, at the lowest estimate, ½ to ¾ per cent. of the coal. From house coal, I have found, from a number of analyses, that the average is over 5 per cent. The domestic hearth, although it only consumes one-fifth of all the coal burnt in the country, is therefore an important factor in the smoke nuisance. Supposing, then, that of the 4000 tons of coal burnt daily in Leeds, ½ per cent. only escapes into the air as soot, this will represent 20 tons a day. This result has been confirmed experimentally by ascertaining the actual amount of soot in the atmosphere. The money value of this wasted fuel is not large, representing only £300 a year; but it means increased expenditure in other directions. The washing-bill alone would represent an important item. I know the case of a lady who resided in Leeds and left for a similar establishment in the country—*i.e.*, she occupied the same sized house and had the same servants. She wrote to say (I quote her words): "The quantity of soap used in cleaning a room is less than half that used in Leeds; the labour of cleaning less than a quarter. Windows now require cleaning once a month—at least once a fortnight, and sometimes once a week, having been necessary in Leeds. White curtains now last 18 months; in Leeds they were black in three weeks or a month. Generally speaking, white fabrics last three times as long as formerly. If three servants are required to do the work of a town house, two would do it easily in the country."

Most of the soot poured out into the air is blown away; but a certain amount falls. The daily fall was estimated by removing daily a fresh square yard of snow on four consecutive days, melting it, filtering off, and weighing the soot. It was calculated that on the four square miles which include the thickly populated area of Leeds, half-a-ton of soot falls daily. Most of the daily soot-fall is washed away by rain; but a quantity of it remains, and is not removable by rain, for soot contains about 15 per cent. of a sticky oil by means of which it adheres to, and quickly discolours, brick and stone work, as well as fabrics, furniture, and clothes. The amount of permanent deposit was determined by means of glass plates, which were exposed to the open air away from the immediate neighbourhood of chimneys, and which were examined every few weeks. Those exposed about 9 miles from Leeds showed little deposit; those near to or in Leeds became gradually black and opaque. The amount which sticks is approximately 20 to 25 lbs. a day. This is the material which permanently discolours buildings and vegetation, and drapes every object exposed to the air in funereal garb. The soot carried away by the wind may travel many miles before falling to the ground. It is probable that the soot which is carried down by rain, and which is sometimes observed covering the surface of the lakes in the Lake District, is due to clouds intercepting the soot and then being swept by wind long distances until they break and deposit the soot with the rain.

I have not yet referred to the acid constituent of the products evolved by burning coal—namely, sulphurous acid. The presence of this acid is not usually perceptible unless a fog prevails, when the dispersal of the products of combustion is obstructed, and the smoke and acid accumulate. This acid very rapidly changes to sulphuric acid—a very powerful and corrosive substance—which attacks masonry and mortar, and leads to their rapid disintegration.

Finally, I must refer to another effect of smoke—namely, the amount of light absorbed by the smoke-cloud hanging over the city. I found in Leeds that the smoke in some parts of the city absorbs about one-quarter of the total daylight.

The problem of diminishing the emission of smoke by the better consumption of fuel has been attacked, as regards boiler furnaces, by the late Mr. Herbert Fletcher, of Bolton, on behalf of the Committee for Testing Smoke-Preventing Appliances. A most valuable report was issued in 1896, containing his tests and those of other observers, and which concludes with the decisive and important statement that "a manufacturing district might be free from manufacturing smoke—at least, from steam-boilers." The evil of smoke might be met if more attention were paid to the use of gas for firing. It seems incredible in this scientific age that a great box containing dirty lumps of mineral should stand in our best parlours, and that daily the parlourmaid should be employed in removing the waste in the form of cinders from our hearthstones. We are not going to reach the ideal by the aid of "Coalite," or, indeed, by any solid fuel. We must have a fuel which can be led through pipes, which can be conducted where it is wanted and turned on or off when required. We must have a fuel which entails no waste—in other words, one by which complete combustion can be effected and complete utilization of its energy in the form of radiant heat. I hold no brief for the gas companies. An elementary knowledge of the principles of combustion would, I think, convince anyone that combustible gas is the only practicable fuel which will fulfil all the requirements. The domestic fire of the future will be the gas-fire. The present gas-fire is a fledgeling which has not yet left the scientific nest where it was hatched. It has still to grow its feathers and spread its wings.

In conclusion, may I say a word about the public control of smoke? In one of his annual reports, Mr. A. E. Fletcher, a former Chief Alkali Inspector, wrote as follows: "The complaints that are brought against the emission of black smoke from factory chimneys are numerous, but too intermittent and desultory to bring about much diminution of the evil. The Alkali Act gives no power to control common coal smoke, yet at two points it comes so near it that the question has often received my close attention. . . . . Masters will not take the trouble to alter their furnaces, nor will the men alter their methods of stoking their fires, unless they are compelled. The numberless alterations made in the construction and conduct of chemical works during the last twenty years would never have been carried out but for the pressure brought on the manufacturers by means of the Alkali Act."

The foregoing paragraph contains, I believe, the real solution of the problem of effective control. Manchester and a few other places are no doubt energetically exercising their powers to reduce smoke emission; but the great majority of towns are quite apathetic. The noxious fumes of chemical works are controlled by a staff of experts. Is there any reason why smoke should not be regarded as a noxious fume and be subject to the same control? Not only the public, but the manufacturer, has derived very substantial advantages from the visits and advice of Alkali Inspectors. There is no reason to suppose that the control of chimneys by men of this stamp would not prove equally effective in smoke prevention.

On Wednesday evening, Mr. H. KENDRICK, of Stretford, gave a lecture on

MAINTENANCE AND ADJUSTMENT OF INCANDESCENT BURNERS.

The causes of poor light from incandescent gas-burners are many—namely, badly constructed burners, deficient gas-jets, deficient air-ports, dirty nipples, choked bunsen tubes, corroded gauzes, damaged mantles, and defective gas supply.

The first three may be taken together. In order to obtain the

scientific maximum amount of light from any gas-burner, it ought to be tested and adjusted in the position in which it is to be used. Hence the many gas-burners now provided with gas and air adjusters. Many of the cheaper forms of burners are made abroad, where the gas is generally of lower illuminating power than in this country; and the holes in the gas-nipples and air-ports are made to suit. But when these are sold indiscriminately in this country, it does not need a great stretch of the imagination to anticipate the result. Gas of poor illuminating power is generally of lower specific gravity than richer gas, and requires less air for complete combustion; so that a cheap German burner made in a town where 10-candle gas is in use, if brought into this district where the quality averages 18 candles, will not give anything like its normal light, because the air-ports will not allow of sufficient air being mixed with the gas to get the maximum heat. A rich gas is also a heavy gas, and unless the pressure in the pipes is excessive, it is not possible to drive through the holes in the nipple sufficient gas of comparative rich quality to fill the mantle when used in conjunction with such a burner as we have been discussing. The heavy gas cannot, under ordinary circumstances, be driven through the nipple in sufficient quantity to fully utilize the air that can be drawn in, if the holes are too small—the effect being a poor light, because the flame is deficient in heat. On the other hand, if the nipple be too large, the amount of gas passed is too great, and the velocity too slow, to draw in sufficient air for complete combustion—the result being a poor light, because of incomplete combustion. If the air-holes are too large, the flame will be cool, because there is too much air in the mixture.

To get the maximum results, therefore, the gas and air mixture ought to be as nearly exact as possible, and the combustion practically perfect. These conditions cannot be produced with the cheap burners sold so largely in many districts; but they can be if some form of adjustable burner is adopted. These naturally cost more than do the others I have mentioned; but the extra cost will be saved in the end by a longer life, easier adjustment, probably a less consumption of gas, and certainly a more brilliant light. Many burners are now sold that are fitted with both adjustable gas and air arrangements, and bring us within measurable distance of the scientific maximum. Others rely on the adjustment at the tap for the gas, but fit the burner with an air-adjuster; others, again, prefer fixed air-ports, and change the nipple to suit the quality and pressure of the gas, endeavouring to keep the consumption constant. One make of these burners, under good conditions, is no doubt the best in the market; but the difficulty of providing the proper-sized nipple to suit the varying conditions often obviates all the advantages that arise from its construction. The fixed gas delivery controlled by the bracket or pendant tap, and with adjustable air supply, seems to be on the whole more suitable for general use, though it is open to the grave objection that checking the gas at the tap will often reduce the pressure below what is necessary to give the best mixture to the bunsen tube. Still, it has the advantage that the air can always be adjusted to give the best results with the gas coming forward. We are therefore once more left with the fully adjustable burner, where the pressure of the gas is not reduced at the nipple (the gas comes through at the maximum velocity), and the air can be adjusted to a nicety. The cost of these, as I have before stated, will be saved many times over, either by a saving in consumption of gas or by the more brilliant light emitted.

I have come across some dealers who sell cheap burners, but, in order to obtain a more powerful light, enlarge the holes in the nipples and the air-ports. This, however, is not economical, as the greater light is not due to efficiency, but to increased consumption of gas—a result not encouraged, but rather deplored, by gas managers, despite the generally entertained idea that the gas authorities only desire everyone to have a large gas account. If the gas consumers will pause to think over the matter, they will realize that such a course would be very bad policy on the part of gas suppliers.

Vertical and inverted burners are now to be obtained with both gas and air adjusters, or air-adjusters only. The best method to be adopted in adjusting a burner to any position is only to allow sufficient gas to pass the nipple to fill the mantle with flame. This can be easily arranged if a gas-adjuster is in use. If not, the size of the holes in the nipple must be either enlarged or reduced. To enlarge them, a rimer must be used to cut a clean hole; and to reduce them, they must be hammered up on a proper anvil. The tool used for enlarging the holes in a nipple is very often a needle, which, however, does not add to the efficiency of the burner, as the holes it makes are not cut with sharp edges, but merely forced and with rounded edges. The effect of these latter is to reduce very much the velocity of the gas-jet in the bunsen tube, and thus impair the mixture of air and gas, on which depends so much. Having now adjusted the gas, all we have to do is to rotate the air-slide until the buzzing noise ceases, when the burner should be giving its maximum light.

The necessity of these adjustments is explained by the fact that most burners are made to suit the public gas supply of the town where they are manufactured. This may be a rich or poor coal gas or a rich or poor mixed gas—the latter being a heavier gas than the former. We have therefore four principal varieties of gas in this country; and it is quite possible to have burners of four different makes in the same room, which will give different results, though rated to pass the same quantity at the factories they were made in.

There is a difference between the weights of the rich and poor coal gases and between the rich and poor mixed gases; and at constant pressure all four require holes in the nipples rather different in each case, to pass the same quantity of gas. Again, they require different proportions of air for complete combustion, without which it is impossible to obtain maximum results. The rich coal gas requires a larger proportion of air than the poor coal gas, and both require more than the mixed gases; while the rich mixed gas requires more air than the poor mixed gas. To suit these varying conditions, it is indispensable that an air-adjuster should be provided; and in the better types of burner they are never absent.

The next three causes of bad lights (dirty nipples, choked bunsen tubes, and corroded gauzes) are also best taken together, as all arise from the one thing—wear and tear. A neglected gas-burner, like a badly-constructed one, is anything but a joy to the beholder. Often the light is only a fraction of what it should be. The mantle, only half, or even less, filled with flame, and correspondingly incandescent, flickers with the least draught of air, and rises and falls as though there were water in the fittings; or the flame appears above the mantle top, and the mantle is more or less blackened by deposits of soot. The former is caused by a deficiency of gas; the latter by a deficiency of air.

It is necessary, in order to obtain the maximum light, to keep all burners as clean as possible—not outwardly clean, that is always done in well-regulated households and in many shops and offices, but in others I know, and generally in warehouses and workshops, they rarely receive the attention necessary. Not until householders and proprietors realize that a well-regulated and properly-maintained burner means more light and probably less gas, will they receive the attention they should. Many gas undertakings regularly keep their consumers' burners in order by a monthly or fortnightly inspection, at a charge of from ½d. to 1d. per burner per month, according to number; and I recommend the adoption of this system to the more enterprising of the plumbers and gas-fitters. Youths can be readily trained to the work in a short time; and with the business it would bring in (mantles and other goods), it would soon prove remunerative.

In calling burners "dirty," I do not wish to cast any reflections on the ladies. In every room in a house there is always a certain amount of dust. In sweeping the floor, raking out the ashes, or even dusting the furniture and fittings, a certain amount is driven into the air and settles down on the gas burners. In course of time, this accumulates, and is burned on the parts. The action of the bunsen tube draws in air, which contains dust. The heat burns this, and it is deposited on the burner parts. The mantles, being exceedingly fragile, are always parting with some particles. These add to the accumulation, and being out of sight in a small tube, escape the vigilant eye of the lady of the house. Consumers are advised to clean their burners every time a new mantle is put on, and are very often content with blowing down the tube. But this is not sufficient. The burner-head and bunsen tube ought to be removed from the nipple, and brushed out with a suitable brush. It is astonishing what an amount of dirt will be obtained from even a burner that has had regular attention. If the nipple be now examined, it will probably be found coated with a hard deposit that requires some little force to remove. The holes will also be found to be furred up, and the edges irregular. These should be cleaned with a proper rimer, not a needle. When they are cleaned and put together again, it will be found that the burners will give equally as good a light as when new. These operations sound formidable when described; but in reality they will be found to occupy only a few minutes for each burner. As to the effects, the furred holes in the nipple prevent the gas coming through with the regularity or speed that is necessary to produce the proper mixture; the burnt dust on the side of the burner-tube retards the flow of the mixture to the head; and the choked gauze prevents the proper distribution of the flame over the surface of the mantle. These may appear in themselves small matters; but they are important. It is necessary, to ensure a good light, that the holes in the nipple are round and with clean-cut edges, that the bunsen tube is smooth inside, and that the gauze is clear and perfect.

Defective lights are often caused by keeping in use mantles that are distorted, broken, and otherwise damaged. This is a "penny wise and pound foolish" policy. A perfect mantle confines the flame as in a cage, and every part becomes incandescent; but make a rent in it, and immediately the flame will flare out, relieving the pressure inside and reducing the incandescence. If, as the hole is a small one, the pressure inside the mantle is sufficient to cause a tongue of flame to shoot out, and if it impinges on the chimney or globe, a fracture results, which often ruins the glass and mantle as well. It pays, therefore, on the ground of economy, as well of efficiency, to change a mantle as soon as any serious defect develops.

Defective gas supply is also a frequent cause of trouble. This may be due to irregularities in the distributing mains and service-pipes, which only the gas manager can put right. Wrought-iron service-pipes are liable to all sorts of troubles, due to internal corrosions, deposits of hydrocarbons from the gas itself, subsidences in the soil, and atmospheric changes. All these matters can be attended to and put right by a letter addressed to the gas office; and much inconvenience would be prevented if the intimation was sent without any delay. The meter is also liable to go wrong, whether of the wet or the dry pattern. The inspectors are not always absolutely reliable when watering; and when short of water, a float inside the meter drops and closes a valve,

shutting off the supply of gas. In the dry meter, the valves get displaced, and cause oscillation or interception of the supply; while both, if exposed to cold, cause trouble if the weather is frosty. All these little matters are subjects of annoyance to the consumer, and beyond the power of the gas-works authorities to entirely prevent. But the average Englishman must vent his feelings on somebody or something when he is put out; and generally the harmless gas itself, as well as the much maligned gas manager, comes in for some choice, if strong, expressions. The gas manager is often blamed for interior troubles also. Many stoppages or partial stoppages are caused by careless plumbing, the accidental running of solder into the joints of lead pipes and of white lead into screwed joints, the leaving of sand in brass castings, or the use of too much grease on the taps, and consequently blocking of the gas-ways. In old houses, the pipes, which were ample in the early days of gas lighting, are often quite inadequate for present requirements; and unthinking householders will blame gas suppliers for faults over which they have no control. Unfortunately, these defects have a far greater effect on incandescent burners than on the old flat-flame burners, and give rise to prejudices in the minds of many people. A little patience, and the exercise of a little forethought, will obviate many of the inconveniences.

To recapitulate, the most satisfactory form of burner is one in which both the air and gas can be adjusted to suit local circumstances. If a choice has to be made, a burner with an air-adjuster only is better than one with a gas-adjuster only. Adjusting the gas supply with the tap is unsatisfactory, as it checks the pressure and velocity of the gas. The maximum illumination from any given burner depends on the proper admixture of air and gas. The proper admixture depends on the burners being kept in perfect order, and the gas-jets being of the correct size and form. Stoppages in pipes and fittings mean decreased pressure and imperfect admixture and deficient light.

Before I close, I wish to say a few words on the effect of colours on the diffusion of light. The technical term is the illuminating effect as distinct from the illuminating power. What is known as the illuminating power of the gas is the light emitted when the gas is burning at the rate of 5 cubic feet per hour in a standard argand burner, and compared with a standard sperm candle burning at the rate of 120 grains per hour. The illuminating power of the gas-burner in an open flat flame varies according to the parliamentary standard of the various works; but when consumed in an incandescent gas-burner, the light emitted does not altogether depend on the old illuminating power of the gas, but on its heat-giving properties. To a certain limited extent this follows the illuminating power; but with incandescent burners that can be adjusted, the difference in the heat generated by the combustion of different qualities of gas can to a great extent be neglected, as they are very much less in proportion to the difference in illuminating power.

The amount of light given by flat-flame burners averages from 2½ to 3 candles per cubic foot of gas consumed; while with the incandescent burner it averages from 15 to 20 candles per foot. With high-pressure and special burners, up to 40 candles per foot can be obtained.

The lights being all different in contour, the wave lengths are different; and any medium therefore that either obstructs the passage of light or reflects light from its surface, will have a far greater proportionate effect on the higher power light with its shorter wave-lengths than on the lower power with its longer lengths. The passage of light through any medium such as glass reduces by refraction and absorption its intensity, even though it be clear; the ascending scale being ground, opal, and coloured. Of the common colours used in globes, &c., yellows, blues, greens, and reds, the two latter have by far the worst effect, as they permit very little light to pass through. The prevailing fashion to have the decorations of dining and other rooms finished in all shades of red and green is responsible for much of the poor lighting of our homes. The illuminating power of the gas or burners may be the same; but the illuminating effect is utterly destroyed by the absorptive power of these colours. Dull papers or paints are much more troublesome than varnished or surfaced papers; while the lighter colours—yellows, pale greens, pinks, or light blue—reflect instead of absorb the light, and add to, instead of detract from, the illuminating effect of the burners. The style and colouring of the furnishings have an effect on the appearance of the lighted room; and to produce the same amount of apparent light or illumination in a dark decorated room as in one of lighter shades, high-power burners should be used.

An example of this kind occurs in a house with which I am well acquainted. The dining and drawing rooms are practically the same area. They are each lighted from the centre of the ceiling by a pendant having the same number and same make of burners; but decorations and furnishings are entirely different. The dining-room is decorated in a medium-green paper, dead in finish, the fittings are dark walnut, the furniture is also dark walnut, the pictures to match, with little or no reflective surfaces, and the shades of the gas-burners are pale green to clear. The drawing-room is decorated in gold and white, the fittings are white, the furniture highly polished though dark, the pictures provided with wide white mounts, while the shades on the gas-burners are pale gold to clear. In the one room there are very few reflective surfaces, many absorptive; in the other, nearly all reflective surfaces, and very few absorptive. The burners required to produce an equal illumination are two in the drawing-room and four in the dining-room—an object-lesson to all who visit there. But so great is the hold of fashion in many cases, that custom has to give way to economy. Of course, I may be told that it is more economical to have dark decorations instead of light; but all I ask is, do not blame the gas authorities because the dining-room is not so well lighted as the drawing-room.

On Friday, Mr. J. H. Brearley, of Longwood, delivered a lecture on

GAS HYGIENE AND VENTILATION.

There have been so many contributions to this subject during the last few years, that if I were able to think you knew all about them, this lecture would be entirely superfluous. It will be assumed that you have given little thought to the subject, or that, through some obscure, yet inspired, newspaper paragraph, you have been led to believe that gas as an illuminant is unhealthy, and compares unfavourably with electricity as regards hygiene. If you have been fed upon this class of fiction, it will possibly come as a surprise to you to learn that many great authorities conclusively prove otherwise. If used properly, gas lighting undoubtedly affords the best artificial lighting, as regards health, at present procurable. In order to make the best use of its advantages, it is desirable to observe one or two of the simpler principles of heat as applied to ventilation.

You are doubtless aware that the chief constituents of the air we breathe are two gases, one indifferent and the other active—viz., nitrogen and oxygen. The former exists in air in the proportion of 79·1 and the latter 20·9 per cent. There are traces of other bodies—water vapour, argon, carbon dioxide, and ammonia—but the two elements that are chiefly relative to our subject to-night are oxygen and carbon dioxide; the latter being present in the atmosphere of towns in the proportion of from 3 to 4 parts in 10,000. Oxygen is the great supporter of all animal life.

Not only is animal life dependent upon oxygen; but so also is combustion. Wherever there is a fire—be it gas, coal, coke, wood, or that much exploited Coalite—chemical change is replacing the oxygen of the air by carbon dioxide. With all luminous flames—gas, oil, candles, matches—the same sort of thing is going on. A cubic foot of gas will produce, roughly speaking, half-a-cubic foot of carbon dioxide. It is upon this point of carbon dioxide that much gross exaggeration and misrepresentation have been going on, and are still going on wherever electricity is in the unfortunate position of having to compete with a gas undertaking that understands its business and the product it supplies to the community.

Faraday calculated that the daily quantity of oxygen used up by the processes of animal life, combustion, and decay—*i.e.*, oxidation of metals, &c.—was no less than 3,500,000 tons. Yet spite of this, as Professor Lewes recently said, "analyses continued over the past 100 years have failed to detect any diminution in the quantity of oxygen, or increase in the quantity of carbon dioxide. So that it is manifest that Nature must have at hand some method, not only for the removal of carbon dioxide from the air, but also for the reproduction of oxygen; otherwise the atmosphere would rapidly deteriorate and become unfit to support life." Carbon dioxide neither supports life nor does it aid combustion. It is a product of respiration, and it is only produced by combustion.

When carbon dioxide is produced by respiration, it is accompanied by traces of organic matter—a most important point when considering the air of rooms. It is this poisonous organic matter that largely renders the atmosphere of rooms stuffy and unpleasant. The remark that one frequently hears, that a room is "too hot," is usually not due to temperature at all, but to the impurity of the air through the respiration of the occupants. Authorities upon the subject attribute to the organic matter produced by breathing one of the chief causes of scrofulous and tubercular diseases. As organic matter is not produced by combustion, it will be at once seen that there is an enormous difference between the products of breathing and the products of combustion.

It has been proved that carbon dioxide is never present in the air of rooms in such quantities as to be harmful. In this very city many years ago Dr. Angus Smith demonstrated that a man can breathe much more carbon dioxide without discomfort than is ever found in the air of dwelling-rooms. He shut himself up in an air-tight chamber with a lighted candle, and stayed there even after the candle went out. The carbon dioxide reached as high as 229 parts in 10,000, or 38 times more than the sanitary limit of 6 volumes in 10,000, before he left his self-imposed prison. Yet he lived to tell the tale and to suffer no ill-effects.

On the other hand, experiments conducted nearly twenty years ago by Dr. Richardson proved that, even after the whole of the carbon dioxide had been taken from the air that had once been breathed, animals introduced into it dwindled away rapidly and died. What further evidence is needed to prove that the discomfort of crowded rooms is not due to carbon dioxide at all, but to the organic matter produced by breathing? The function which carbon dioxide plays in the testing of the air of rooms is appropriately defined by Dr. Whitelegge, in his work entitled "Public Hygiene," as follows: "When carbonic acid is present in excess, it is to be regarded as indicating concomitant and injurious organic impurity, of which it is the harmless index.

About three years back, some remarkable experiments were conducted by Professor Benedict, at Middletown (Conn.), U.S.A., with what is known as the respiration calorimeter. Men who were experimented upon lived for days in an atmosphere containing never less than 27 parts of carbon dioxide in 10,000, and sometimes as much as 225 parts in 10,000—the latter amount closely approximating to the proportion which Dr. Angus Smith survived. In no case was any ill-effect on the subjects noticed, either during the experiment or afterwards.

The sensation of close or bad air in a room is no doubt at times partly due to temperature. This, however, cannot in these days of economical gas lighting be in any way ascribed to the use of gas if applied properly. It is almost invariably due to failure to regulate the heating apparatus in accordance with the dictates of the thermometer and common sense. How often one finds when visiting friends that they will insist on "firing up" when the room is already over-heated, in the misguided notion that it makes people feel "cosy."

There is one other foe to the healthiness of living rooms—viz., dust. Mr. John Aitken, of Falkirk, a distinguished scientist, devised an ingenious instrument, which he termed a "dust counter;" and by means of which he was able to count the number of particles of dust in air obtained in different places, and under various conditions. From a series of exhaustive tests, he found the following dust particles under the various conditions enumerated:

TABLE OF DUST PARTICLES.—*Test by Mr. Aitken.*

Position.	Dust Particles per Cubic Inch.
Outside air, after rain	521,000
,, ,, when dry	2,119,000
Inside air, 4 feet from floor	30,318,000
,, ,, near ceiling	88,346,000
,, ,, over a gas-burner	489,000,000

NOTE.—The number found in a cubic inch near the ceiling is equal to the population of Great Britain, and the number found in a cubic inch of air over a gas-burner is equal to the population of the whole world.

First of all it should be pointed out that the quantity of gas consumed in rooms now is considerably less than formerly. Three bijou inverted burners, consuming 3 cubic feet of gas per hour, will give a light of 60 to 70 candles, and illuminate splendidly a room of 2000 cubic feet capacity. The quantity of heat units given off will be, approximately, 1800. To obtain the amount of light before the evolution of the incandescent gas-burner would have meant a consumption of at least 20 cubic feet of gas, with 12,000 heat units given off. This light would not be provided in less units than 5 cubic feet, or (say) four burners, each consuming 5 cubic feet of gas per hour. In those days ceilings got blackened; and, strange though it may seem, this blackening of ceilings was evidence of valuable sanitary work performed by the gas-flame, and the heat which it generated. With the 1-foot per hour burners, however, such a diffusion of the heat can be obtained as will distribute the dust drawn into the convection currents more evenly on the ceiling area; and though the localized patches of cremated dust are absent, there is a valuable hygienic work going on all the same.

All sorts of terrible microbes exist in dust, in countless numbers and innumerable varieties. They exist, too, in the products of breathing; and herein lies one of the fearful dangers of breathing over again air once exhaled from other people's lungs.

The air of ill-ventilated rooms, then, contains organic poisons partly as a result of respiration, and partly from the dissemination or diffusion of dust particles. These poisons have been likened to "a lawless fraction of people in an orderly society." How can this invisible mob (none the less dangerous because of their invisibility) be reduced to subjection or rendered harmless? There are two ways. Either the air must be sterilized, or we must adopt, as a medical man once put it, the London policeman's remedy for obstruction—"Move them on." To satisfactorily put into practice both these methods, a coalition is required between the gas engineer and the architect. Perhaps it would be better to say that all that is required is for the architect to put into practice the remedy that lies to his hands. The gas engineer already supplies the gas which provides the most satisfactory remedy; but unfortunately the architect does not, except in exceptional cases, make the best use of it from the point of view of hygiene.

No gas engineer would be audacious enough to claim that the sterilization of the air of living rooms is completely effected by gas lighting; but he would be well within the limits of truth if he claimed that large portions of such air is sterilized. Professor Leyman has shown that the bacilli of tuberculosis will die if exposed for one minute to a temperature of 203° Fahr., in one hour if exposed to a temperature of 140° Fahr., or in four hours if exposed to a temperature of 131° Fahr. When you reflect upon the amount of air which is set in circulation by burning gas, as will be demonstrated, you must know that large volumes of it are subjected to considerably higher temperatures than those given. As it circulates in and around the gas-flame, the bacilli, and the spores of bacilli, are destroyed. Not only is the foul air of respiration sterilized, but the dangers of dust—that conglomeration of dead flies, street sweepings, and the like—are minimized.

In this direction gas, apart from anything the architect may do, performs a great purifying function. But there is no system about it. The air sterilized may be 50 per cent., it may be 40 per cent., or it may be only 10 per cent. of the whole. To make the air conditions entirely satisfactory, it should, in addition, be moved from the room as quickly as prevention of draughts will permit. It is here that the architects can make or mar the satisfactory ventilation of rooms. The simple provision of outlets for the foul air near the ceiling should not be optional, but compulsory in all apartments in which human beings have to spend a large portion of their time. When the gas is burning, there is a stream of heated products towards the ceiling; and if an outlet is provided above them, and a properly proportioned conduit formed to the chimney breast or to the outer air, there will be at once a means of ensuring that, under normal conditions, the air of rooms is quite satisfactory.

To properly appreciate the remaining and more practical portion of this lecture, therefore, it is necessary to bear in mind the principal points dealt with up to now—viz.: (1) Carbon dioxide in itself as found in rooms is absolutely harmless. (2) The real source of stuffiness in rooms is either (*a*) air fouled by breathing, or (*b*) excess of temperature. (3) Dust exists in rooms in large quantities as compared with outside air.

Seeing that the carbon dioxide of combustion cannot be injurious to health under any conditions of use, we may consider how far the products of combustion in a gas-lighted room may be made to assist in removing the only really harmful constituents in the air—viz., the products of respiration, and the particles of dust. [The lecturer demonstrated the manner in which the heat of gas puts into movement large volumes of air; the method employed being a tube measuring 8 in. by 9 in.—*i.e.*, half a square foot area—by 2 ft. 6 in. long, fitted at the top with an anemometer, and inside at the bottom with an ordinary Kern burner.]

Air Put in Motion by a Welsbach-Kern Burner.

Cubic Feet Consumed per Hour.	Cubic Feet of Air Put in Motion.	Rise in Temperature. Deg. Fahr.
2	3920	18
3	4150	26
4	4330	32

It will be seen that in each of the three tests twice the air contents of an ordinary sized apartment were projected through the tube each hour. The degrees rise in temperature was obtained by calculation, assuming all the heat units to be given to the stream of air. The volume was actually observed by an anemometer.

As it may be suggested that such a test is of little practical application since burners are seldom put into enclosed conduits in this way, the attachment as shown was made, and when the incandescent burner was placed below, conditions fairly approximating to an ordinary room with a perforated ceiling mould were reproduced. A series of observations on various burners placed at 2, 3, and 4 feet away from the dummy mould were made; and the following are the results:—

Table Showing the Quantity of Air Passing Through a Tube, with a Perforated Inlet, per Hour with Different Burners.

Type of Burner.	Gas Consumption per Hour. Cubic Feet.	Distance from Perforation. Feet.	Quantity of Air passed per Hour. Cubic Feet.
Bijou	1	2	3060
,,	1	3	2800
,,	1	4	1980
,,	2	2	4190
,,	2	3	3650
,,	2	4	2650
Kern	3	2	4820
,,	3	3	4540
,,	3	4	3720
,,	4	2	5730
,,	4	3	5160
,,	4	4	4250

The value of gas as an ejector of foul air from rooms is here strikingly demonstrated. Even when using an ordinary bijou inverted burner, consuming gas at the rate of 1 cubic foot per hour, 4 feet away from the dummy mould, the quantity of air passed per hour was 1980 cubic feet; while when the burner was brought within 2 feet, the quantity of air passed was 3060 cubic feet. With the Kern No. 4 burner, 4245 cubic feet of air was moved at 4 feet distant, and 5730 cubic feet at 2 feet distance. In the last-named case, the quantity of air projected through the tube was actually greater than when the same burner was placed within the tube. The air would, however, be at a less temperature.

Some further experiments were made with a view to finding out whether a length of horizontal flue intervening between the dummy mould and the vertical shaft had an adverse influence upon the volume passing through. For this purpose a horizontal tube of the same diameter was placed between the vertical piece and the dummy mould; and the tests under these conditions showed that the volume was approximately reduced one-third. This seemed to point to the importance of having flues with a continuous rise, or alternatively fixing in the mould an inner tube through which the products of combustion could pass through

and set up a "blowing action," so as to overcome the cold mass of air in the horizontal tube.

A burner consuming 4 cubic feet of gas will provide ample illumination for a room of 2500 cubic feet capacity, or (say) 200 square feet of floor area. If the figures quoted are worth anything, they show that four bijou burners placed 4 feet from the ceiling ought, in a properly constructed house, to move away nearly 8000 cubic feet of air, or three times the contents of a 2500 cubic feet room, assuming the burners to be placed at separate points and ejecting into separate conduits. Rooms of this size, however, are most frequently lit from one point; and even then 4 feet of gas, burned 4 feet away, should move 4250 cubic feet per hour.

Some writer has said, "It is easy to make a building breathe if it is caught young." This is essentially true of schemes for ventilating buildings by gas. A good arrangement is to carry a conduit under the floor boards of the room above, and by a separate flue-pipe to a point discharging above the roof. If the conduit under the floor boards can be laid with a slight rise towards the vertical portion, so much the better. It is desirable to pack the foul-air pipes with non-conducting material throughout their entire length, to prevent cooling of the current and consequent diminished draught. A good arrangement is to use an annular pipe with the space between the two casings packed with slag wool. At the outlet of the flue-pipe an efficient ventilator cowl should be provided, so that no down-draught occurs.

A word or two as to the proportioning of such flues. For the purpose of illustration, it may be laid down that an ordinary living room, used continually, should be ventilated to the extent of removing 1000 cubic feet of air per person in the room. A room of 2000 cubic feet capacity containing four persons would require, therefore, the removal of 4000 cubic feet per hour, after the first two hours. It has been shown that a No. 4 Kern burner will put at least this quantity of air in motion. The speed at the outlet tube may be calculated at 20 feet per second. For the removal of 4000 cubic feet therefore per hour, a tube would be required as follows :—

$$\frac{4000}{3600 \text{ (seconds in one hour)} \times 20 \text{ (feet per second)}} = \text{·055 foot area,}$$

or about 8 inches, which is the area of a circular tube a little over 3 inches in diameter. Allowing for friction, slag-wool packing, and the second tube enclosing the whole, the size would be about 5 inches outside measurement. Such a tube, if properly fitted, would satisfactorily ventilate the great majority of present-day living rooms.

While provision is made for taking bad air away, consideration should be given to the air inlets. Currents of air moving in a room should not exceed a speed of 5 feet per second, or draughts will be felt. It is not unusual to rely upon windows and doors for the sole means of air inlet; and when this is done, sharp currents of air are sure to prevail in certain portions of the room. A great many people seem to think that the air supply should be warmed before entering a room.

The hygienic advantage of warming air, however, is doubtful. English people prefer those systems of heating that warm the objects in a room while keeping the air comparatively cool. In any case the system is hardly practicable as regards ordinary residences, for the expense of pre-warming air would prevent its adoption; and, indeed, there is no necessity for it if the cool air can be admitted without creating draughts. To supplement the supply of air coming by the door and the windows, Tobin tubes should be provided. The important point about these tubes is that they put the air supply under regulation.

A modifying factor, and an important one, is the domestic fire and its chimney. A large amount of ventilation is effected by it; but so far as respiratory and lighting combustion products are concerned, it is in the wrong place. Once the latter have reached the ceiling, it should be unnecessary to bring them round and about the heads of the people sitting "round" the fire, to get them safely ejected.

A properly proportioned gas-fire will move, approximately, not less than three times the air contents of a room within an hour. A coal-fire is more uncertain in its action. There is great waste in the shape of unconsumed smoke; and the condition of the fire varies so enormously that, on an average, probably four to six times the air contents of a room are moved by it within the hour. The fact that a gas-fire, once at full glow, practically ensures perfect regulation of ventilation—assuming the inlets and ceiling outlet to be all right—gives it a great advantage over the old-fashioned coal-range.

This, however, is diverging somewhat from the point we were leading up to—viz., the size of Tobin tube inlets. Taking into consideration the intermittent opening and closing of doors, it may be accepted that, in a room of 2000 cubic feet capacity, a tube capable of admitting 2000 cubic feet of air per hour will be ample. Allowing for friction, this means a tube about 4 in. by 8 in. Fresh air should be poured into rooms at such a point as to avoid all possibility of draught complaints. The corners of outside walls can best be utilized for this purpose.

A considerable amount of original research upon chimney draughts and the currents prevailing in vitriol chambers has been done by Mr. Herbert Porter, F.I.C., an Inspector in the Alkali Works Department of the Local Government Board. The result of these investigations has borne considerable practical fruit as regards the manufacture of sulphuric acid. I have been enabled to apply similar tests and observations to the currents of hot and cold air prevailing in ordinary living rooms; and the miniature room here shown has been prepared under his guidance, and upon the lines of his models illustrating air currents and movements of gases, and as used in his lectures to the Society of Chemical Industry and the Manchester Chemical Club. The room is of about 10 cubic feet capacity. It is provided with the usual domestic chimney, a window to open at the top or bottom by sliding, a door, outlets for the products of burning gas and the currents of air which are carried along with the same, air-tubes at each corner, a damper into the chimney at the ceiling level, and underneath a "smoke furnace," which projects smoke through an outlet in the centre of the floor of the model. The smoke is produced by paper soaked in sodium nitrate and afterwards dried. The ceiling plate in the model really consists of two tubes—an inner one through which the heat products pass, forming an ejector, and an outer and larger one through which the foul air as it reaches the ceiling is drawn.

[The lecturer then demonstrated, with the aid of the model and slides, the effects of the opening and closing of flues, &c., on the ventilation of a room, and went on to remark that anyone who had ever attempted to hang a picture near the ceiling of a room with no outlet at that point, knew how much ventilating energy was there wasted, simply for the want of a device similar to the one shown.]

As a matter of historic interest, it may be observed that steam has been applied to the purpose of ejecting foul air; but steam means cost, and the condensed products are more difficult to deal with than those from gas.

Electric fans have come into considerable prominence as agents of ventilation; but here, again, current must be provided—entailing cost additional to that incurred for lighting. The proper proportioning of fans for rooms, too, is a point frequently neglected, with draughts as a consequence. Anyone familar with this type of air-ejector will know that they are often put out of use, either temporarily or permanently, because of this, or because of being "noisy"—ventilation then being reduced.

Ceiling outlets, which, though efficient, completely hide the "void" necessary for gas ventilation, are made in many choice designs. Gas has been extensively used for ventilating large rooms, and in the form of sunlights is most effective for theatres and large halls. In this form gas is frequently called upon to promote the ventilation which electric lighting installations lack. Similar devices are now to be had with incandescent lighting instead of flat-flame burners—thus combining the most effective ventilation with the source of lighting.

If air analysis had been considered as important as water analysis, it is more than likely that the truths here expressed would have been known to all ere this. I ask you earnestly to ponder over them, for the health of the people must concern you as individuals; and the subject dealt with to-night has a much greater bearing upon health than is usually accredited to it.

For a considerable amount of experimental assistance, and the preparations of some of the illustrations, I am indebted to my Assistants, Messrs. E. Sainter and H. Singleton.

Last night (Monday), Mr. J. W. Graham, M.A., of Victoria University, Manchester, gave a lecture on

A READY REMEDY FOR SMOKE.

The lecturer devoted the first part of his discourse to depicting the evils of smoke, and describing its deleterious effect upon the inhabitants of towns; and he pointed out that our climate causes it to be not only an evil in itself, but an indirect producer of mischief through the fog it creates and flavours. He quoted the Hon. Rollo Russell to show that smoke causes fogs in three different ways. In the first place, solid particles of soot radiate heat to a much greater extent than other kinds of dust; and this property of carbon makes the air cooler, and extends the precipitation of fog. Secondly, the particles of soot block the way of the sunlight, and the streets are buried under a black canopy of sooty particles. Finally, and worst of all, the tarry substances in smoke cover every globule of foggy moisture with a thin oily sheath which prevents its evaporation. The Council of the Meteorological Society and the London County Council have reported, as the result of their investigations, that one fog in five is caused directly by smoke; and the gentlemen above alluded to calculated that in a great town the actual cost of smoke and fog is about £1 per head per annum. In addition to the economic loss, fog kills asthmatic and bronchial patients and weakly invalids like a poison. In 1880, a fog which lasted three weeks produced an extra 3000 deaths; and in 1892 a single week of fog caused 1484 additional deaths in London.

Having stated the extent of the evil, the lecturer proceeded to consider how it could be mitigated. He declared that of all the causes which most insidiously and most universally separate human life now from the environment to which it is properly adapted, the reckless use of raw coal is the chief. We have had, as it were, he said, a kind of intoxication in the use of coal, and the result is smoke and fog, depressed vitality, universal ugliness, a smudge over all things, and the sense of living in a dirty world. The burning of crude coal has not the natural beauty and fitness that are associated with a "simple life" in harmony with Nature. Civilized man turns it into gas, coke, tar, and sulphate of am-

monia, and finds special uses for each of them. Together they sell for three times the original value of the coal. When treated in its crude state, and burnt as it is found, much of its usefulness is worse than wasted. We must treat our coal in a more civilized manner, said the lecturer, if we are to cease to reap all the evil and little of the good of that double-edged thing—civilization. Our task must be to become so much more civilized than we are that we shall still retain our sunshine, be able to keep our homes clean, and cease to waste our national capital. This we can do by arranging to burn our coal into gas and the bye-products of gas manufacture.

Mr. Graham went on to show that the cures for smoke are numerous, and rightly so; but the most thorough cure for manufacturing smoke is the use of gas-engines. When, he said, one can obtain 1 H.P. for 0·1d. per hour for fuel, this cannot but commend itself to those who wish to put down new plant. It stands to reason that a gas-engine will consume less coal per horse power than a steam-engine; for it is a most roundabout process, and losing power at every point, to carry coal about, produce heat by burning it, with that heat turn water into steam, and use the pressure of compressed steam to turn the wheels round. In a gas-engine, the energy produced is used directly by exploding gas in the cylinder. He quoted from the report of the Royal Commission on Coal Supplies to show that gas-engines are the most economical of heat-motors; and that their general introduction, and the use of producer gas, could not fail to have an important effect on the consumption of coal.

The lecturer next passed on to consider the bearing of economy in the consumption of coal effected by the extended use of gas-engines on the question of the probable duration of our supplies; and in this connection he touched upon the subject of the export of coal. He confessed to being in favour of the imposition of a duty, beginning with the shilling per ton formerly charged, and gradually increasing so as to check seriously the sending of coal out of the country. In this way, he said, though the colliery trade must immediately suffer, it would have the advantage of becoming more steady and regular, instead of being as now liable to that irregularity and unsteadiness of employment, which is the worst feature in a labouring man's life.

He was aware that this proposal was disputable, and would be disputed; but he thought nothing but good could arise from its free discussion. On ordinary economic lines, considering only the present, export duties were indefensible, for they discouraged trade by killing the market. But he was willing to sacrifice the national profit immediately arising from the export of coal, in order that he might be able to save the national loss which would ultimately follow from having to import coal from Germany when our own was exhausted. Excessive dearness of coal struck at the root of our whole livelihood.

Coming back to the subject of the use of gas, Mr. Graham pointed out that the gas-engine was only one of its possible and profitable spheres. He showed how it could be employed in firing puddling furnaces and pottery ovens. In regard to the latter, he said there was every sign that the conservatism of the manufacturers must before long give way, and gas plant become universal in the Potteries district, which was now one of the most hideous in the country, and inhabited by some of the roughest of the population. In a paper on "The Pottery Oven of the Future," by Mr. W. F. Murray, published in the "Transactions" of the English Ceramic Society, he showed, on the authority of Messrs. Rowan and Tatlock, that the cost of gas-firing was only 23 per cent. of that in coal-fired ovens, and saved 16 out of 30 hours' time. Roughly, gas-fired ovens did the work in half the time and at one-fourth the expense of those fired by coal. He thought that, if the potters would not be convinced by the experience detailed in the paper referred to, there was nothing for the public to do but to compel them to cease making their absolutely unjustifiable clouds of smoke, wasting energy, and ruining human life over a little nest of towns in the north corner of Staffordshire. The lecturer thought gas-works should be set up at the pit's mouth and power produced there. If coal were made into Mond gas, suction, producer, or ordinary illuminating gas of low candle power. and utilized on the spot, he was convinced great economy would be effected. The product and the bye-products of one trade were the raw materials of another; and therefore great saving might accrue from the concentration of various coal, gas, and tar using trades near the pits. He pointed out that already, in many parts of England there are central power stations, which are easily kept smokeless, for the distribution of electricity or some kind of power gas.

Taking up again the smoke problem, Mr. Graham said that the toughest part of it was the domestic grate. Certain kinds of grate diminished smoky chimneys, but did not cure them. Gas-fires were the only practical cure which was complete. They had won all along the line for use in halls, offices, consulting-rooms, dining-rooms, bed-rooms, and any place where work was to be saved and a fire was needed for a short time only. They did not give off any deleterious fumes or produce undue dryness, provided a proper chimney draught was arranged for. They were, however, still in most places more costly than coal for fires in use all day; and, somehow, they were not so pretty as they might be. This was a direction in which cheap gas and beautiful production might go together. There was a general agreement that gas at from 1s. 6d. to 2s. per 1000 cubic feet could compete with coal for all-day use. It was found that the cost of fuel at the stations of the 25 Metropolitan electric light undertakings was as great as that of gas at 2s. 1d. per 1000 cubic feet. There seemed to him to be no good reason why gas should not be sold at a little more than 1s. 6d. per 1000 cubic feet over all the smokiest part of England—viz., the neighbourhood of the coal-fields. He arrived at this conclusion from the figures for Manchester, Sheffield, and Widnes, and, making due allowances, from those of the South Metropolitan Gas Company. Mr. Graham then proceeded to show how he thought this might be done; and this portion of his lecture we give in full.

The most immediately necessary course is to persuade our City Fathers to sell gas not higher—I will venture to say a trifle lower—than cost price. At present, as we know, it is common to make a profit on the gas undertaking for the relief of the rates, and it is supposed to be clever finance to do so. No private business divided into a number of departments would congratulate itself upon the financial ability by which the account of one department was credited with a profit in order that another might cover a corresponding loss; the fact being ostentatiously winked at that a heavy income-tax of 1s. in the pound was abstracted on the way. Manchester, by doing so, hands over in some years £60,000, in other years £50,000, from the pockets of its gas consumers to the pockets of its ratepayers; and it pays to the Government in most years £3000 in income-tax on gas profits so called, for the pure pleasure of doing so. If the ratepayer and the gas consumer—who are roughly the same body of citizens—paid gas bills exactly proportionate to their rate assessments, no one would be any better and no one any worse. That is, however, not the case. The owner of cottage property is a man through whom heavy rates are paid, and he probably feels any rise or fall in the rates, not being able to adjust his rents with equal facility. On the other hand, the manufacturer or the shopkeeper uses gas in his business in addition to his domestic lighting. He, therefore, is fined in his gas bill to the extent that the property owner escapes. But it is he who makes the business of the city—he is the working partner in the alliance of capital and brains; and to tax him more than others is contrary to all sound principles of finance. If it ended here, it would merely be one more inequality in a world full of inequalities. But it does not end here; for, as we have seen, it is in the use of gas that we have our best hope for the purification of the air of our manufacturing towns. To charge gas an artificially high price is to wilfully wreck the atmosphere of the city. To spend gas surpluses on public improvements is one of the most delicious ironies of administration I have ever encountered. Our Corporation would effect more public improvement by making no gas surplus at all than by spending it on widening streets for the smuts to come down upon, and erecting buildings originally white.

So far I have only pleaded for selling gas at cost price; but there is a sound reason for selling a little below cost. The man who uses gas instead of coal is a public benefactor. He does not make his share of the smoke which saps the vitality, depresses the spirits, and dirties the doorsteps of his neighbours. If everyone were like him, public lighting, public draining, public scavenging, and public health would cost the city less. He should, therefore, be encouraged by equitable adjustment of his civic burdens. I will suggest one way in which this might be done. At present the gas-works and gas-mains pay a heavy local rate. This local rate is calculated with curiously malicious ingenuity upon the said factitious profits. If, therefore, these factitious profits were abandoned, the gas-works would pay hardly any rates to the city. This may be said to be a kind of relief from a normal element of cost of production and a slight encouragement for the gas consumer. At the present time, then, taking the figures for 1905, before the rise in coal, we pay 3d. per 1000 cubic feet in profits to the rates, and about 2½d. per 1000 cubic feet in direct rates on the gas undertaking, making a possible economy of 5½d. If we took 6d. off the 2s. 3d. now charged for gas, we find that the Corporation could sell gas at 1s. 9d. without making a loss. This I suggest for a beginning. It would immediately result in an increased use of gas, unless our whole experience is to be belied. Every fall in the price of gas has hitherto resulted in increased consumption; and that increase would bring the cost per 1000 cubic feet still further down, for gas is particularly one of those things in which the fixed capital is large and the profit very much dependent on the extent of the output. Moreover, the additional gas which would be used for power and heating would be a daylight demand; thus using the gas plant at times when it is otherwise not working to its full strength. In economies of this kind often lies the whole secret of the profit of a business. I venture to prophesy that gas sold at 1s. 9d. per 1000 feet would still yield a profit to the Gas Committee, which would enable them in a year or two to drop to 1s. 6d., unless the price of coal interfered.

I see no single flaw in the argument I have adduced, and no sensible reason why it could not be put into action at once. The Gas Committee are not an obstacle in the way; they are converted to this policy already. But I find on approaching the Finance Department of the Corporation that they are quite unable to look beyond the one issue of the rates. If the Gas Committee did not find the money, the other Committee would have to do so; and they do not give another moment's consideration to so terrible a prospect. It would be well for us to have more unity of purpose in the City Council, and a broader view over the whole problem before them. They are too apt at present to behave as though

each Committee were keeping a separate shop, with no connection with the others. Is there not in the city some courageous statesman who will be able to persuade the people to add 7d. to their rates, subtract 5d. per 1000 cubic feet from their gas bills, and save thereby an immediate £3000 a year, with the prospect of more and the hope of sunshine?

COMPOSITION, COST, AND PREVENTION OF TOWN SMOKE.

In the notice of the lectures which appeared in the "JOURNAL" last week, one delivered on the above subject by Mr. R. H. CLAYTON, the Vice-President of the Chemical Club, on the 26th ult., was briefly dealt with. In view of Mr. Graham's lecture on a cognate subject, we give a few additional particulars from that of Mr. Clayton, including an interesting table of analyses of smoke and the atmosphere of Manchester.

Mr. Clayton said he hoped to show that many of the efforts made to solve the smoke problem had been very misguided. Its solution must come by attacking the domestic fire. Taking the average consumption of coal for domestic purposes as 1¼ tons per head per annum, the total annual consumption for England would be 50 million tons altogether. The coal consumed by factories, chemical works, iron foundries, and other trades amounted to 65 million tons per annum; but a great deal of this was used for purposes which were absolutely smokeless. Take, for example, the Mond gas plants. These in the neighbourhood of Manchester alone would account for a million tons a year; and the process was completely smokeless. Another cause which was bringing about the diminution of factory smoke was the growing use of mechanical stokers. The lecturer instanced the two chimneys of the Salford Corporation electric lighting station, where mechanical stokers were used. He said it was marvellous how little smoke was emitted; one might almost imagine they were never working there. It was the same with the Manchester electricity works. These two establishments alone accounted for about 100,000 tons per annum. Only part, therefore, of the coal used in factories, &c., was burnt in a smoke-producing way. On the subject of the waste of fuel involved in the emission of smoke, Mr. Clayton said the percentage of loss from this cause in the case of a factory chimney was very small. It could be calculated as 1, 2, or 3 per cent. of the fuel; whereas the loss in the case of a domestic chimney was something like 50 per cent.

The lecturer endeavoured to demonstrate, by an interesting series of analyses, that the pollution of the atmosphere in Manchester was mainly from domestic smoke. He pointed out that the distinctive characteristic of domestic smoke is that it is laden with oily hydrocarbons (tarry oils) and ammonia, owing to its being produced at a low temperature; whereas factory smoke is nearly all pure carbon. In the following table of analyses of domestic smoke, factory smoke, and the Manchester atmosphere, these constituents are calculated according to the proportion they bear to the amount of pure carbon:—

Origin.	Carbon.	Hydrocarbons.		Ash.	Ammonia Calculated as Ammonium Sulphate.
		Acid Constituents Soluble in Caustic Soda.	Tarry Oils Soluble in Benzene.		
Domestic soot . . .	100	34·70	29·50	40·7	61·40
Do. (Knecht) .	100	23·70	28 30	40·6	28·30
Boiler soot—					
Aver. of 36 hours .	100	0·24	1·73	26·2	..
,, 4 days . .	100	0·30	2·20	43·6	4·60
Chimney emitting dense smoke for three hours . . .	100	0·26	4·45	11·3	3 13
Manchester air—					
Analysis by Bailey .	100	..	36·60	94·0	..
Deposit on air filters—					
Midland Hotel . .	100	9·13	18·20	130·0	20·40
Do. week-end .	100	18·80	24·70	94·2	18·80
Manchester snow—					
Whitworth Street (Knecht) . . .	100	..	7 70	115·0	0·62
Cheetham Hill (Irwin)	100	..	14·20	91·0	..

Mr. Clayton pointed out that the analysis of the polluting matter in Manchester air shows that it approximates most nearly to domestic smoke, as is evidenced by the amount of tarry oils, ammonia, and some other constituents that are characteristic of domestic smoke. He said the comparatively innocent appearance of a domestic chimney was due in great degree to the fact that a large amount of the smoke came off in the form of these oils, which, when in a hot and vaporous state, were colourless, not black like factory smoke. Another reason for the better appearance of domestic smoke at the actual moment of being poured out was that it was diluted with a considerably larger amount of air. Ten times as much air, in proportion to the amount of coal burnt, passed up a domestic chimney as passed up a factory chimney. Pointing to a diagram of an ordinary domestic grate and a gas-retort, the lecturer observed that they were constructed on very much the same principle. Both were distilling the coal; but in the one the products of distillation were poured into the air, in the other they were collected and used as valuable materials.

INDICATED POWER AND MECHANICAL EFFICIENCY OF THE GAS-ENGINE.

An Extra Meeting of the Institution of Mechanical Engineers was held on Friday, for the purpose of further discussing the paper by Mr. Bertram Hopkinson, M.A., Professor of Mechanism and Applied Mechanics in the University of Cambridge. An abstract of the paper, together with a brief indication of the trend of the remarks made by the speakers who took part in so much of the discussion as there was time for at the meeting at which it was read, appeared in the "JOURNAL" for the 22nd ult. (p. 255).

Captain SANKEY, who opened the resumed discussion, said the paper could be divided into two parts—the errors in the indicator, and the method of determining the indicated horse power by means of friction diagrams. As regarded the first part, he (the speaker), as a member of the Committee on Gas-Engines of the Institution of Civil Engineers, was glad that the author agreed that pencil indicators could not be depended upon, at any rate as nearly as many people imagined. At the previous meeting, Professor Burstall said that, with great precautions, one could get the indicated horse power within a few per cent., but in his first report to the Gas-Engine Committee of the Institution he showed that the ordinary pencil indicator had errors of about 5 per cent.; so he (the speaker) thought they were in agreement that, unless extraordinary care was exercised, one could not depend upon the indicators being nearer than *plus* or *minus* 5 per cent. These remarks, of course, referred to the old form of pencil indicators. He understood, however, there had been improvements lately; and he should not be surprised if with these one could get within (say) *plus* or *minus* 3 per cent. He would like to ask the author whether he found any difficulty in replacing the spring of his indicator in position—whether he found any difference in calibration. It had been remarked to him that the paper was a very nice academic one; but, it was asked, what was the practical value of it? Well, years ago, the economy of gas-engines was not what it was at the present time. That was to say, there was formerly a large margin to pick up, and now the margin was very small; and directly this stage was reached, the means of measurement must be more accurate, and they must be able to discriminate between the various losses. This was what Professor Hopkinson had done in his paper.

Mr. H. WILMOT SPENCER remarked that the Crosby indicator had been mentioned; and the paper almost suggested that the errors were more than were actually found in this apparatus. A point that had been overlooked was that there were adjustments in the pencil indicator that would practically prevent any appreciable backlash. They did not suggest that the Crosby indicator was by any means perfect; and it was originally designed for workshop and practical everyday use. They did say that they came within 5 per cent., if the indicator was in proper adjustment, and in experienced hands.

Mr. DUGALD CLERK said he was very pleased to find Professor Hopkinson had arrived at efficiencies very closely approximating to those found by the Institution of Civil Engineers Committee. He quite agreed with part of the author's criticism of the methods of the Institution; but they had to do the best they could with the indicators at their disposal. He found that Professor Hopkinson gave the range of efficiency of this Crossley engine (which was approximately of the same dimensions as the engine X used by the Committee of the Institution of Civil Engineers) as 85 to 90 per cent.; while the Institutions's figures gave roughly from 86 to 89 per cent. In Professor Hopkinson's tests, one determination of efficiency of this particular engine was 86·2 per cent. Well, he had had occasion, for the purposes of a paper which he read last year, to deduce some figures from the results obtained by the Institution Committee; and he found that taking the determinations of the Institution Committee, and adopting the mean of the two methods, he made the efficiency of engine X 86 per cent. So that he got exactly the same figure as Professor Hopkinson had given. It was generally assumed that the mechanical friction of an engine was the same at light and full loads; but he could not think that this was the case. He thought there must be greater friction with heavy than with light load. As Professor Dalby had pointed out at the previous meeting, a second method was used by the Committee which gave lower results than the first; but taking the mean of the two, he (Mr. Dugald Clerk) thought they might assume that the mechanical efficiency of these particular engines was determined with quite sufficient accuracy. He found himself in complete agreement with the author in the matter of indicators. During the past thirty years, he had had a large experience; and he had great difficulty in obtaining accurate results. There was no doubt that, when very great precautions were taken, it was possible to get fairly good results, and Continental observers seemed to have done so. The use of an optical indicator was very desirable; and he had no doubt from what he had seen of Professor Hopkinson's indicator in use at Cambridge University, that he had a very good instrument indeed. He himself had made an optical indicator, which differed from Professor Hopkinson's to some extent. To begin with, he wanted to be quite sure that the paper on which the card was taken exactly copied the motion of the piston; and he found it was better to go back to the old method of coupling the sliding frame direct to the

piston. He arranged the indicator in this way, with the direct-coupled sliding frame carrying the photographic indicator card, and this frame was coupled up by strong connecting-rods. He welcomed the paper very much. Professor Hopkinson was an important recruit to those who wished to investigate the phenomena of the gas-engine, and desired to arrive at some finality with regard to its thermo-dynamics.

Mr. E. J. Davis said, with reference to indicators, that if the pencil was on the cylinder and the card fixed on something quite separate, the cylinder motion must have some effect on the card; but where the indicator was fixed compact upon the cylinder, it had no effect whatever.

Mr. Larrard thought a weakness of the paper was that there were so many assumptions that required confirmation or modification. He pointed to various respects in which he contended that working results showed that some modifications were needed. He thought Professor Hopkinson had produced a beautiful instrument, which for moderate speeds would no doubt be the best piston indicator yet designed; but he believed that for very high-speed engines it marked a retrograde step.

Professor Robert Smith remarked that 180 revolutions a minute was not a very high speed to deal with; but they had, apart from this speed of revolution, the great suddenness of the rise of pressure, which was probably considerably greater than in the case of the steam-engine, and also the suddenness of the fall of pressure, which was very much greater than with a steam-engine, and which was of just as much importance as the suddenness of the rise of pressure. There was one disturbing influence which seemed to have received no notice. They were all aware of the very liberal lubrication that gas-engines required; and an interesting question was how far the thermo-dynamic and other efficiencies of the engine were affected by the evaporation and burning of the lubricating oil in the cylinder. He agreed with Professor Hopkinson in thinking that one of the difficulties to be contended with was the errors in indicators. He had always found—and he had used every indicator on the market, with the exception of the M'Innes—that under difficult conditions, 5, or 6, or 7 per cent. error was quite possible, and under the most difficult conditions there might be a still larger error. He thought one of the greatest and most important improvements in indicator designs was the use of external springs, which were not affected by variations of temperature.

Mr. C. H. Winfield pointed out that the arrangement of the mirror on Professor Hopkinson's indicator allowed of a small error creeping in.

Professor Shaw said one important use of the optical indicator would be in the investigation of obscure points about which they knew so little. One of these was the effect of the injection of water into the cylinder. It was remarkable that there should be such different results when water was injected into the cylinder of a gas-engine or a petroleum engine. With the gas-engine, Professor Hopkinson said there was no difference whatever in the form of the indicator diagram when he injected water; but in the case of the petroleum engine the indicator diagram must change. The optical indicator would be very useful in throwing light upon this point.

Other speakers having contributed shortly to the discussion,

Professor Hopkinson rose to reply. He said the debate had been largely a battle of indicators. The remarks he made as to the inaccuracies of the pencil indicator, he was glad to say, had been confirmed by many authorities. Professor Burstall had referred more particularly to the work done in Germany by Herr Meyer in the year 1901, and had suggested rather that he (the speaker) had ignored that work. The work was excellent; but it was now somewhat out of date. Conditions which Herr Meyer had to meet were not those that had to be met by them to-day. No one knew better than Professor Burstall the advances that had been made in gas-engine practice during the past eight years; but he could hardly have realized the effect this change in gas-engines must have on the method of testing them. While the mean pressure of the gas-engine had not altered during recent years, the maximum pressures had gone up by leaps and bounds; and the consequence was that they had to alter the springs. The maximum pressure of an engine used by Herr Meyer was 300 lbs. per square inch; whereas the engine he (the author) had been using had a maximum pressure of about 600 lbs. The errors Herr Meyer found and dealt with would be doubled in the case of a modern engine using pencil indicators. In spite of what Professor Burstall said, he still thought he had made out a good case against pencil indicators. One important point was the question of whether the optical indicator was to be a piston or a diaphragm indicator. There were a good many objections to diaphragm indicators; and if he had to do all his work over again, he should certainly not take an instrument of this kind. The diaphragm was constantly in contact with the hot gases; and he did not see how it was to be kept cool. And if it was not kept cool, he did not see how it was possible to get accurate results. In designing his instruments his desire had been to get an indicator that he could use on all sorts of engines; and the outcome had been the apparatus he had described. It was he thought a very much simpler and not so delicate a job as the diaphragm indicators he had seen. It was also very cheap; the whole outfit costing only about £15. Nevertheless, he believed that the diaphragm indicator had a large field. It would come in for very high speeds. He could not run his instrument at present at more than 1200 revolutions.

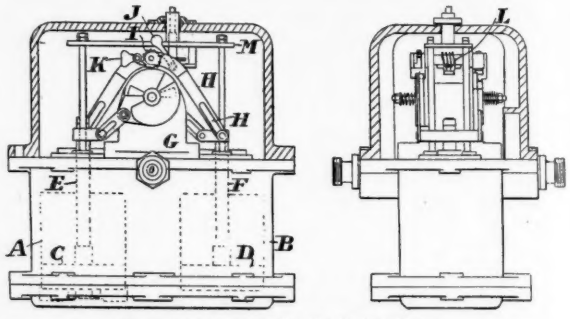
REGISTER OF PATENTS.

Water-Meters.

Hayward Tyler and Co. (the Directors of), of Queen Victoria Street, E.C.

No. 21,446; Sept. 27, 1906.

This invention relates to a liquid meter with two double-acting measuring cylinders provided with pistons and piston rods, which, by slotted links, impart part rotary reciprocating motion to disc valves of sector shape and having a cavity on the face side for regulating the admission to, or the exhaust from, the top and bottom of the cylinders. The valve operated by one piston controls the water admission to, and emission from, the other cylinder; the piston-rods also, by slotted links, transmitting part rotary motion, always in the same direction, by means of two weighted pawls to pawl wheels, which convey the motion to a spindle connected with the counter or indicator.



Hayward, Tyler, and Co.'s Water-Meter.

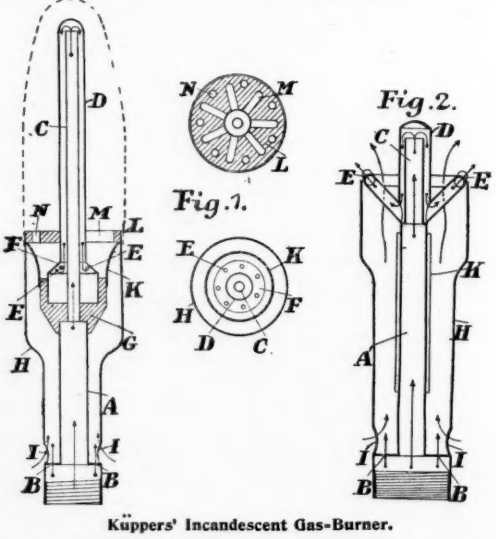
As shown, the cylinders A B are arranged side by side in one casting, and are provided with pistons C D. The inlet and outlet are on the back and front respectively. The piston-rods E F pass out through stuffing-box glands and have cross-heads fixed to them. On the cylinder cover is fixed a valve-box G, provided with ports and passages leading to the ends of each cylinder, and another passage leading to the exhaust. A disc valve, of sector shape and having a cavity on its faced side, is provided for each cylinder, to work in the valve-box against its face provided with sector-shaped ports. A valve actuated from the piston-rod of one cylinder controls the motion of the piston of the other cylinder, to admit the water alternately to one end, or to that of the other cylinder, while the opposite end is exhausted. The valves are kept against their ported faces by springs, and receive motion by slotted links connected to them and to the cross-heads on the piston-rods E F; the cross-heads being also provided with gudgeons, which work in slots in the links that at their other end take on to a spindle provided with pawl-wheels I; the levers at that end being fitted with weighted propelling pawls J K so that the pawl-wheel spindle receives intermittent partial rotation in the same direction by the upward and downward play of the pistons C D in the cylinders. The rotation of the pawl-wheel spindle is by a worm L transmitted to a worm wheel on a spindle connected to the counter or indicator. This worm-wheel gear is carried by a bridge M fixed to pillars which at their lower ends are fixed in the cylinder cover.

Incandescent Burners.

Küppers, K., of Aachen, Germany.

No. 22,013; Oct. 5, 1906.

This invention relates to "a new method of working, and a new burner acting according thereto, whereby, without employing gases



Küppers' Incandescent Gas-Burner.

obtained by superheating or dissociating steam, a blue flame is produced, of high temperature, with a suitably situated combustion zone."

The gas is introduced into a bunsen flame, "or, *vice versâ*, bunsen gas into a flame of heated gas," and, if desired, the bunsen gas may also be heated.

Fig. 1 shows a vertical and two cross sections of a burner with mantle; fig. 2, a vertical section of an alternative type of burner.

The inner tube A has at its lower end a flange or heel piece, in which are formed small openings B. To the tube A is connected a tube C, which is itself surrounded by the tube D closed at the top. This latter ends in a downwardly directed surface F, in which openings E are formed in a circle. The whole apparatus is placed within an isolating socket G, from which "good conducting surfaces" may project in order to supply heat to the surrounding gases. Further, the tube D may be provided with projecting parts and be surrounded below by an isolating cover. The apparatus is surrounded by the tube H, in the lower end of which are air-inlets I. The upper part of the tube bears the annular sieve K and cover L, which is provided with openings M and N.

During combustion, gas passes out through the openings B, mixes with the air entering through I, and escapes above, in the form of "bunsen" gas, through the openings M N of the covering disc L. At the same time gas is blown out of the openings E, through the slots M, into the bunsen flame. As by this means the tube D within the flame becomes strongly heated, the gas escaping from E will also be strongly heated.

In fig. 2 is shown a somewhat modified heating construction. Here there is provided the tube A^1 closed at the top, the lower end of which, at B^1, is perforated or otherwise provided with openings. The heat is conducted from the upper part of the tube downwards; and this heat is given off to the gas which flows through it.

If desired, the openings E may conduct the gas to the outer instead of to the inner surface of the flame. This is the case with the burner shown, in which the "bunsen" gas, passing up the tube H, is introduced into the interior of the burning mantle of gas issuing from the openings E. Good conducting surfaces K are arranged to project from the tube A, so as to supply heat to the surrounding bunsen gas.

By this device a very good effect is said to be obtained, "because the gas which comes to the burning point is strongly heated, and the combustion is effected consequently upon the upper service of a more or less thin-walled flame mantle, because the gas particles blown in to the flame through the openings E first enter into combustion when mixed at the periphery of the flame."

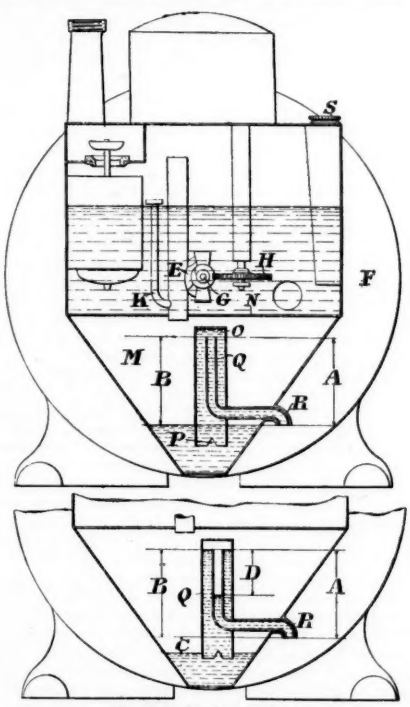
Gas-Meters.

CLOUDSLEY, J. L., jun., of Reigate.

No. 23,688; Oct. 24, 1906.

This invention relates to wet gas-meters, and more specifically to those in which the water-level is clearly defined by a syphon having a bell cap in a well-known manner.

In such meters, the patentee points out, difficulties have in practice occurred with reference to the refilling, during which operation greater pressure exists in the inlet than in the outlet chamber, whereby the water level in the inlet chamber falls, while in the outlet chamber it rises. If, therefore, the meter is filled while in operation, a considerable surplus of water will be put in; and, in consequence, when the consumption rate falls, the surplus water passes to the overflow chamber.



Cloudsley's Gas-Meter.

The object of the present invention is to provide means for the discharge of the overflow so as to keep the overflow box always ready to take the maximum surplus discharge, and, further, to effect this without destroying the gas seal; and it consists in a syphon applied to an overflow chamber in such a way as to render practically always the whole of the chamber available for surplus water while still retaining an efficient gas seal.

The upper part of this engraving shows a wet meter fitted with an overflow box and syphon in accordance with this invention—the water levels being those which obtain when the meter is filled while disconnected from the gas supply; while the lower part shows the water levels when the meter is filled during operation.

The gas, on entering the meter, passes through a float-controlled valve, and then by a branch E into a wheel which rotates in the circular casing F, in the well known manner. The wheel effects the rotation of the spindle G and the counting mechanism H.

To the central tube there is also attached, at a lower level than the branch E, an overflow pipe K, through which, as is usual, surplus water passes and falls through the open end of the pipe into the overflow box M, which is separated from the upper box, by a partition, N. In the overflow box is arranged the discharge syphon, which consists of an outer tube O, having V notches P at its lower end, and an inner tube Q, reaching up within the tube O, and passing outside the casing of the meter. Outside, the tube Q is bent so as to form a spout R, the lower end of which is squared off and provided with an ordinary form of cap (not shown).

The operation of the device is as follows: Assume the meter is filled while disconnected, then atmospheric pressure only will exist in the chamber M. Water is filled in through the opening S in the upper case; and when the required level is reached, surplus water flows over into the overflow chamber M, through the pipe K. This water rises in the overflow chamber M till the syphon tube O is filled, and the discharge through the inner tube Q then starts. This discharge continues till the level in the overflow chamber is that shown in the upper figure.

When, however, the vessel is subjected to a pressure, the water in the overflow chamber continues to be exhausted through the syphon until the notches P are reached, when gas bubbles up through the inner tube until equilibrium is obtained. Thus, assume 2 inches of gas pressure in M, and assume the dimensions of A = 3 inches, B = 3 inches, and C = $\frac{1}{2}$ inch; then, in order to get equilibrium, D must be $1\frac{1}{2}$ inches, because (A – D) + C must balance the 2 inches of gas pressure; and as C = $\frac{1}{2}$ inch, (A – D) must equal $1\frac{1}{2}$ inches.

It will be seen therefore that a good seal is thus obtained, and that the whole capacity of the overflow chamber is practically available for surplus water. It is also possible to dispense with the "condensation" chamber formerly employed.

The object of squaring off the end of the spout R is to obtain capillary action, and thereby effect a good cut-off; while the notches at the end of the tube allow small bubbles of gas to pass up the tube O without breaking the seal at the end of the tube. Further, the tube O and inner tube G may be extended up through the partition N, so as to permit of increased pressures being used, or a "double seal" may be employed.

Manufacture and Purification of Illuminating Gas.

DUNCAN, G., and HARDIE, W., of North Shields.

No. 29,291; Dec. 22, 1906.

The object of this invention is "the preparation of a mixture of liquid hydrocarbon compounds of the methane and olefine series which possesses the property of removing naphthalene with certainty from gas manufactured from coal or other carbonaceous material distilled at high temperatures."

The patentees carry the invention into effect in the following manner: They take as raw materials all the oils, &c., which are obtained by distilling cannel coal, shale, or any other suitable material, at a temperature sufficiently low—*i.e.*, from about 500° C. to about 900° C.—to produce a comparatively large proportion of liquid hydrocarbon products when the gaseous products which are evolved from the retort wherein the distillation of the carbonaceous material is being effected become cooled down to atmospheric temperature. The crude oils obtained by these means, they point out, consist largely of compounds of the methane and olefine series, together with tarry matter containing benzenes, phenols, and basic substances, such as pyridine, &c. The basic and acid substances are respectively removed by agitation with sulphuric acid and soda solutions by customary methods. The mixed oils are then subjected to distillation for the purpose of isolating the oils which are employed to constitute the mixture to be used as the naphthalene solvent. This fraction, having a density below ·840, is retained for the purpose of preparing the solvent. The portion thus obtained is then subjected to one or more distillations for the purpose of isolating the fractions of hydrocarbon compounds belonging to the methane and olefine series, which have various densities and boiling points ranging from ·768 to ·820 and 140° to 270° C. respectively—the number of such distillations required depending upon the original composition of the oils. The mixture obtained has a density of from ·794 to ·800, and is said to be "capable of removing naphthalene with great rapidity and certainty from gases obtained from coal or other carbonaceous material distilled at high temperatures."

The most advantageous method of employing the solvent is to remove from the gas to be treated all traces of tarry matter, ammonia, and hydrogen sulphide, and afterwards bring the gas into close contact with the mixture in some form of Livesey washer or rotary washer-scrubber "through which the gas may pass in finely-divided streams while being subjected to treatment with the naphthalene solvent." After the naphthalene mixture or solvent becomes "spent," it is removed and replaced by fresh oil.

When the gas is treated in the manner described, it is said to be "completely deprived of the undesirable compound naphthalene; thus permitting the gas to pass into the distributing system in such a condition that no further inconvenience arising from naphthalene deposits in the mains and service pipes is experienced."

The patentees wish it to be understood that they are aware that it has been proposed to employ as a naphthalene solvent, liquid hydrocarbons obtained by distilling hydrocarbonaceous material at low temperature; and they make no broad claim to a naphthalene solvent so produced. But they declare that what they claim is: (1) The improved solvent for the removal of naphthalene from gas employed for heating and illuminating purposes, consisting of a mixture of liquid hydrocarbons of the methane and olefine series, the said mixture being prepared from oils obtained from cannel coal, shale, or other suitable material by destructive distillation at low temperature, by subjecting the said oils to one

or more distillations to isolate the hydrocarbon compounds belonging to the methane and olefine series. (2) The improved method of removing naphthalene from gas employed for heating and illuminating purposes consisting in treating the gas with the solvent claimed in Claim 1 and comprising a mixture of liquid hydrocarbons of the methane and olefine series prepared from oils obtained from cannel coal, shale, or other suitable material.

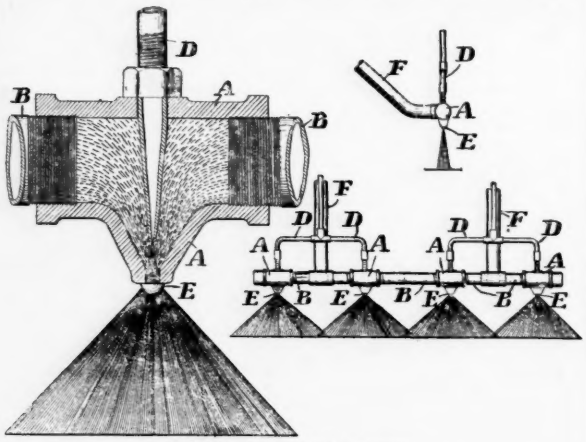
Spraying Tar on Roads.

BLAKELEY, W., of Thornhill, near Dewsbury.

No. 4564; Feb. 25, 1907.

This apparatus is for distributing in a finely-divided state tar or other liquid, or semi-liquid, upon roads, either for the purpose of preventing dust arising, or for their repair; and it consists of injectors through which compressed air is caused to pass and come into contact with the tar and force it in the form of fine spray through nozzles.

When the apparatus is in operation, the pipes B are in connection with the tar storage tank, and the pipe D is in connection with the compressed air storage vessel, served by suitable air-pumps. The tar will consequently flow from the storage tank into the chamber A, whence it is forced, through the nozzle E, with considerable violence and sprayed or distributed upon the road. The action of the injector, moreover, causes a vacuum or partial vacuum to be formed in the pipes



Blakeley's Tar Road-Sprayer.

through which the tar is conducted to the chamber A, as a result of which more tar is drawn from the storage vessel to replenish the chamber. Suitable taps are provided so that the apparatus may be placed in action and rendered inoperative as required.

There is illustrated an arrangement of four chambers A, with their attendant parts, screwed to a series of short horizontal pipes B, connected by vertical pipes F with the tar storage reservoir (not shown); the injectors being connected in pairs, by branch pipes D, to vertical pipes G communicating with the compressed air storage vessel (also not shown). This arrangement is a suitable one when the injectors are disposed sufficiently close together to ensure that the separate tar sprays emanating from each slightly overlap. The arrangement of the injectors in this way is advisable, as it ensures that no part of the road within the range of the apparatus will be left uncovered by the sprayed material. It is found that in the action of the injectors the air is mixed with the tar and forms a fine spray, which is forced into the material below the surface of the road—"thus giving a lasting surface."

Controlling the Ignition of Gas-Burners.

AUBLANT, J. J., of Massay (Cher), France.

No. 7176; March 25, 1907. Date claimed under International Convention, March 30, 1906.

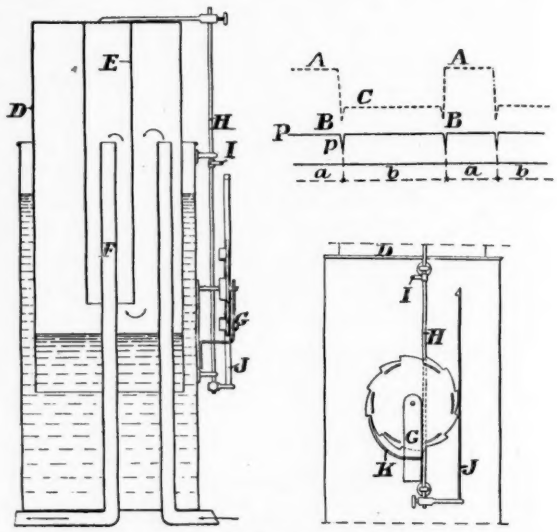
This invention relates to devices adapted to control the ignition and extinction of gas-burners from a distance by momentary variations of pressure in the mains—in this instance, momentary reductions of pressure are utilized to control the lighting.

The apparatus comprises a movable gasholder bell in which the gas supply pipe ends and which carries a pipe, likewise movable, one extremity of which is obstructed hydraulically or freed according as the bell descends or ascends—that is to say, according as the pressure of the gas is diminished or increased—in such a manner as to intercept or permit of the passage of the gas from the movable bell into this pipe itself, and thence into the fixed piping proceeding to the burner, which is provided with a spongy platinum or other similar ignition device.

The apparatus also comprises, broadly, a series of stops carried by a rotating disc and arranged in such a manner as to prevent the movable bell from rising or falling beyond certain points at the proper moment. The disc is rotated automatically through a certain angle each time the bell moves, under the influence of the variations of pressure, beyond a predetermined position. The stops thus advance in succession in appropriate order, either for keeping the bell down when it tends to rise, or to keep it raised when it tends to descend, or, finally, in such a manner as to leave it entirely free.

By these means, by the intermediary of a succession of momentary relative reductions of pressure in a system of pipes serving several appliances, it is possible to obtain different effects according to the arrangement of their own series of stops. For example, it is possible to cause certain burners to be lighted or extinguished sooner or later than the others, or the total duration of the illumination to be greater or less for certain of them, although the same succession of reductions of pressure acts in all the appliances simultaneously.

The illustration shows a vertical section side elevation through the apparatus in the ignition position; also a diagram illustrating the succession of the pressures of the gas and of the corresponding movements of the bell.



Aublant's Lamp Lighter and Extinguisher.

As shown, the apparatus comprises a bell D, movable vertically in a vessel containing an "appropriate" liquid—such as heavy petroleum oil, for example. The gas is conducted into the bell through a pipe connected with the main coming from the works; while at the summit of the bell is a pipe E, closed above and open below, in the interior of which the pipe F proceeding to the burner (not shown) opens. To one side of the vessel, there is fixed a fork G carrying the spindle of a disc provided with ratchet-teeth on its periphery, and with fixed stops on one of its faces. These stops are arranged opposite the ratchet-teeth in front of every second tooth, and are separated by empty spaces corresponding to the intermediate teeth. A rod H, the upper part of which is rigidly connected with the bell D, is able to slide freely through guides fixed to the main vessel. This rod carries a tappet I capable of passing through the spaces or of encountering the stops, according to the position of the disc. In addition to this, the lower part of the rod carries a flexible pawl J, which bears against the teeth on the disc and serves to cause this to rotate, by one tooth each time, the bell, which descends to the bottom of its travel (position B shown in broken lines). Another flexible pawl K fixed to the fork G acts upon the disc in such a manner as to prevent it from turning backwards.

The apparatus acts in the following manner: At the gas-works provision is made for the pressure in the mains to preserve a normal value P, which is substantially constant throughout the day. This value may correspond, for example, to a column of water 6 cm. high; but at given times the pressure is caused to fall for a few instants to a smaller value p, corresponding to 3 cm. for example. The bell D is arranged in such a manner that it may be raised to the top of its travel (position A) by the pressure P, and fall to the bottom of its travel (position B) with the pressure p. In the position indicated in the engraving, the bell is raised, the gas, on entering, passes into the pipe E, the lower extremity of which is above the liquid, and leaves through the pipe F to reach the burner, where it is kindled automatically by means of spongy platinum or some such substance. During this period, which is marked at a on the diagram, the disc presents a vacant space on the vertical path of the tappet I, so that the rod H is able to descend to the bottom of its travel. [In the diagram, the gas pressure is indicated by a firm line, and the position of the bell by a broken line.] At a given moment, the pressure is depressed from P to p. The bell D at once descends to the bottom of its travel (position B); and at the same time the pipe E enters the liquid and intercepts the passage of the gas to the burner, which is extinguished. Further, the pawl J causes the plate to rotate by one tooth in such a manner that one of the stops is caused to occupy the place previously occupied by the vacant space, immediately the latter has permitted of the passage of the tappet I. The reduction of pressure thus produced only lasts for a moment; and the normal pressure P is re-established beneath the bell. The bell, therefore, rises again; but as the tappet I is arrested by the stop above, the bell does not rise above the position C, and the lower extremity of the pipe E remains immersed in the liquid in such a manner that the burner is not rekindled. The travel from B to C is, however, sufficient to enable the pawl J to rise over a fresh tooth of the disc. The extinction period is indicated at b. At another given moment the pressure is again depressed from P to p. The bell again descends to the position B, so that the pawl J causes the disc to rotate by one tooth, and to present a fresh space above the tappet I. At the end of a moment, the pressure returns to its normal value P. This time the bell rises to the top of its travel (position A), the pipe E permits of the passage of the gas, and the burner is automatically rekindled. This operation is repeated each time the pressure is lowered from P to p and then raised from p to P, and it takes place in the same manner simultaneously in all the similar appliances connected with the gas distributing main.

The Widnes Town Council have decided to apply for an Improvement Act in the next session of Parliament. Matters which will be incorporated in the Bill include the amendment of existing provisions as to the application of the surplus revenue of the Gas and Water Department,

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Coalite.

SIR,—Having read with intense interest your correspondent, Mr. F. S. Cripps's, communication in your last issue, concerning "Coalite," I trust you will permit me to supplement his remarks—especially as I am the engineering friend alluded to by him.

The view taken by Mr. Cripps in his correspondence with myself, has been that the process of manufacturing "Coalite" as adopted by Mr. Parker is not novel; and the historic gas-maker, Murdoch, is quoted as having anticipated Mr. Parker's ideas. But it has never been clear to me how such a view can be maintained.

True it is that Murdoch and others sought to carbonize coal in cast-iron retorts; but a *low temperature* to effect this carbonization was not their *aim*. Their aim clearly was to *obtain as large a yield of gas as possible from their charge of coal*. We know, for a fact, that they heated their cast-iron retorts to the extreme limit consistent with the durability of the retort; and it was due to the early gas-maker's demand for a more refractory material that fire-clay retorts were introduced.

If they made "Coalite" (which I doubt if ever was the case), it was by accident; and there is nothing on record that our ancestors ever claimed to manufacture a "flammable" coke, or a coke containing specific qualities of gas.

For any definite attempt to produce a coke containing an appreciable quantity of flammable gas, we must turn to Scott-Moncrieff's experiments and patent claims. These are very concise. What this gentleman did was to employ ordinarily heated retorts, and to *stop carbonization half way*—producing a *semi-carbonized coal*, probably crusted on the exterior, but with a soft core; and this, I imagine, is how "Carbo" is produced.

Now Mr. Parker's process is, as probably everyone knows by this time, to subject a suitable coal to a somewhat continued "stewing" process, at a very low temperature—approximating 800° Fahr., a temperature just above red heat. This Mr. Parker does with the full chemical knowledge that, at this temperature, he can remove certain smoke-giving hydrocarbons, at the same time retain heating and non-luminous gases (principally "marsh gas") in the resultant coke. It is no hap-hazard process, but a carefully studied and thought-out one—the result of years of patient and unremitting labour.

In all the mass of comment found not only in the "JOURNAL," but in other semi-technical journals (comment which, so far as "Coalite," its inventor and its directorate is concerned, has frequently exceeded the limits of common courtesy and decent precepts), there has never been a single valid antecedent claim quoted against the "Coalite" process; and those which have been, will certainly not hold water.

Surely it may be assumed that, with the clever men employed, and the months of patient search made in different countries' patent offices, something would have come to light which would have trenched on Mr. Parker's claim, which, after all, is a very simple one of *temperature* only, if such existed. And it may surely be further assumed that such men as compose the "Coalite" directorate would never have linked themselves to the undertaking if there had been the slightest doubt at the back of their minds that the patent rights in their property were not assured.

Please understand, Sir, that I have no financial interest in "Coalite," nor ever have had. But I am interested in it from a gas-maker's technical point of view; and it has been a matter of extreme regret on my part to note the way the process has been received by the gas community, and the gas technical press in particular. The idea that our industry has been threatened in any way is absurd. From my personal knowledge, the "Coalite" directorate has made earnest endeavours to approach one of our premier companies with the idea of co-operating with them in some manner; and that the gas company concerned should clearly understand and appreciate the process of the manufacture of "Coalite," the Coalite Company offered at their own cost and expense to erect them a plant of such magnitude as to allow them every facility for experiment. They furthermore offered to remove the plant if in due time the gas company saw nothing favourable in the process. It was for no advertising reason that this offer was made, as the Coalite Company pledged themselves to keep the matter private. Surely this was a liberal offer; and it is to be regretted in the gas interests that the offer was declined. My friend Mr. Cripps will regret this incident as much as I do.

It will at once be asked how the gas companies could profit by any alliance with "Coalite," as the 5000 cubic feet of gas per ton from coal transmuted to "Coalite" would be insufficient. True, but by manufacturing a moiety of "Coalite" a 20-candle gas would be available to replace the expensive oil used in water-gas processes, a coke would be produced suitable for home consumption (leaving still a surplus for exportation purposes), a quality of tar containing a large percentage (10 per cent.) of benzol would likewise be produced—and this would leaven the ordinary gas tar, permitting a much better price to be obtained for the same, and what perhaps would appeal to us even more is that the "Coalite" gas mingling with our high-temperature production would aid in reducing the naphthalene nuisance.

But, as far as I can see, the "Coalite" people have no need to worry themselves about the gas companies, as the more one learns about their products—especially the composition of the gas and the quantity and composition of the tar—the more one is surprised at the mine of wealth which is at hand, simply by the treatment of the Coalite gas for ammonia and benzol, and the tar for benzol and analogous constituents.

Assuming the Barking works to eventually carbonize 1400 tons of coal per diem, as projected, producing 7 million cubic feet of gas a day, careful consideration of the composition of the gas gives the result that it will yield, when washed for benzol, some ½ gallon of crude benzol per 1000 cubic feet. This should yield a net profit of 3d. per gallon, or £16,000 a year. Assuming 20 lbs. of sulphate of ammonia per ton be obtained, this would yield an annual profit of £27,000. Assuming the tar to be produced at the rate of 15 gallons per ton (and it is more), and to contain 11 per cent. of benzol, the market price for this would be approximately 2d. per gallon, or £63,875 per annum. The total profit would therefore be £107,809 for benzol, tar, and ammonia. This still leaves "Coalite" itself and the washed and de-illuminated gas to be accounted for. But at any rate it shows a nice little return even on a capital of £750,000.

It need not be pointed out that the production of benzol in the future is likely to become a very important business. The gas-works, and the coke-oven tars, contribute some; but the process of manufacture by either, on the high-heat principle, militates against more than a mere nominal production. In this respect, the "Coalite" process—even if "Coalite" itself should command but a low price—appears to open up vast possibilities.

I must offer you my apologies, Sir, for this long letter; but the subject is of such engrossing interest to those who have studied it that I trust any light I may have been able to throw upon this much debated process may be of eventual use, and that we gas engineers may together calmly discuss what is after all a new departure in gas making.

F. D. MARSHALL,
Past-President of the Institution of Gas Engineers.

19, *Queen Anne's Chambers, S.W., Nov.* 2, 1907.

The "Coalite" Specification.

SIR,—It has been claimed by and on behalf of the Coalite Company that the granting of a patent in Germany or America is sufficient proof that the invention has never been anticipated, and doubtless many of the shareholders in that Company have been impressed by this statement.

It does not follow, however, that because a patent is granted a process has never been anticipated. It only means that, as far as the Patent Office is aware, it has not been anticipated, which is a very different matter. The Patent Office authorities do not claim for themselves the infallibility with which the Coalite Company would endow them. And if the Patent Office authorities cannot do this in England, where gas-lighting originated, I am certain they cannot rightly do so in any other countries, for the simple reason that they do not possess the early literature on the subject.

Mr. Richard Davies' letter in the issue of the "JOURNAL" for Oct. 22 should be read in this light, as should also similar statements by others.

F. S. CRIPPS.

71, *King William Street, E.C., Oct.* 30, 1907.

The Production of Coalite.

SIR,—I have read with great interest the articles which have appeared in the "JOURNAL" on the subject of Coalite—the new fuel which has been patented by Mr. Thomas Parker in England and America. While reading them, it occurred to me that it might be worth while to inform you and your readers that in the first Belgian patent, dated May 5, 1904, taken out in connection with my system of vertical gas-retorts, which has already been described in your columns,* the vaporization apparatus, constituting a new non-explosive generator for the instantaneous production of superheated steam, was designed in such a way as to allow the steam to escape by a series of orifices sloping upwards, and arranged over the whole of the lower part of the third concentric tube of the apparatus. The steam penetrating from all sides the layer of incandescent coke collected in the closed receptacle below each retort, is there decomposed, and produces water gas.

In the description accompanying the specification of this patent I said:

> The water gas produced in the closed receptacle passes into the distillation retort by openings formed perpendicularly to the transverse sides of the blocks of refractory material supporting the retorts, and ending in an opening parallel to the above-mentioned sides, prolonged by a horizontal pipe having at its extremity a tap fixed on the outside of the setting. This tap allows of communication being set up or cut off as desired between the retort and the closed receptacle by means of another pipe, parallel with the first, starting from the tap, and ending in a second opening formed in the supporting block above the first one. This second opening turns in a vertical direction at the middle of the block, and is prolonged into the footings of the two retorts placed side by side; so that, according to the position of the tap, communication is established or shut off between the retort and the closed receptacle.

It will be seen, from the preceding extract, that by my first patent, after having collected the incandescent coke in the closed receptacle, I passed superheated steam through it to produce water gas.

On July 10, 1904, I took out a Belgian patent for improvements in my system. Under it the superheated steam, instead of escaping in the manner described in the original patent, was conveyed by pipes screwed at one end through the lower portion of the third concentric tube of the vaporization apparatus, and ending in a vertical opening formed in the centre of the blocks of refractory material supporting the retorts. This opening is prolonged between the footings of the juxtaposed retorts, and is subsequently divided into two openings formed in the footings, and ending at the base of the retorts above the sliding bottom. The taps and pipes regulating communication between the retorts and the closed receptacles are dispensed with under the improved arrangement.

In the description accompanying the specification of this patent, I said:

> The result of this improvement, which constitutes an advantageous simplification of my new retort-furnaces, is that the conversion of the steam into water gas will be effected entirely in the retorts themselves, by employing for the purpose the incandescent

* See "JOURNAL," Vol. XCIII., pp. 31, 864.

coal from the retorts, while the heat of the glowing coke collected in the closed receptacles will serve solely for the production of the superheated steam.

It is the vaporization apparatus described in my Belgian patent of July, 1904, that has been reproduced in my French, English, German, and Austrian patents, in which no mention is made of the apparatus described and illustrated in my previous patent of May 5. But it was none the less patented in my favour in Belgium as from that date; and consequently my patent is before that of Mr. Parker. This being the case, it has occurred to me whether, by reverting to my original design of vaporization apparatus, which cannot be constructed in England, France, Germany, or Austria, without infringing the patents taken out for it in these countries, it would not be possible to transform quite easily into Coalite the coke produced in gas-works where my system of vertical retorts was installed. All that would be necessary would be to produce water gas in the closed receptacles by means of my original vaporization apparatus, continue doing this up to the moment when the cooling of the coke might give rise to fears as to the production in the water gas of carbonic acid instead of carbonic oxide, and allow the water gas thus generated to penetrate into the retort in the way indicated in the specification of my first Belgian patent. Afterwards the communication between the retort and the closed receptacle by means of a tap could be dispensed with, and the coke quenched by gradually less superheated steam, which would escape to the exterior of the setting by a pipe grafted upon the tap, which should be a three-way instead of an ordinary two-way one. It seems to me that coke quenched in this way and Coalite would be, as we say, *chou vert et vert chou*—in other words, absolutely the same thing.

A. RUMMENS.

Brussels, Oct. 26, 1907.

Heating by Gas-Fires.

SIR,—I have perused with very great interest your articles on the supineness of many gas corporations in the matter of endeavouring to bring about increased sales of gas for use during the time when there is the least demand for gas for lighting purposes, because some years ago I fitted up two of my bedrooms with gas-fires of a somewhat novel character.

In a paper read before a Society of Gas Engineers some two or three years ago, Mr. T. G. Marsh laid down the conditions necessary for a satisfactory gas-fire. There were two or three very powerful reasons why gas-fires had not been more generally adopted. One was the expense of the gas as compared with coal fires, and the other the unhealthiness of the stoves, which rendered the atmosphere dry and uncomfortable to breathe.

In the stoves in my two bedrooms, these two latter objections are practically eliminated. Behind the stoves are a dozen or more 1½-inch wrought-iron tubes leading from an air-chamber at the bottom of the stove, which is supplied with fresh air from outside by means of a wrought-iron tube. The action is thus as follows: When the gas is lit, the vertical air-tubes become heated; and a rapid current of air is set up through the tubes, which discharge streams of fresh air to the top of the room.

The stove was described in "Chambers' Journal" of Nov. 1, 1899, as follows: A stove "which heats by bringing a continuous supply of fresh air into a room, removing the vitiated air, and practically renewing the atmosphere in a room hourly. This removes the objection to gas heating, which uses up the atmosphere and makes the air too dry for health. At the same time, by an ingenious arrangement for moistening, the moisture required by the air to render it suitable to breathe at the higher temperature is automatically introduced, and a uniform temperature is maintained in every part of the room—the parts farthest from the stove being quite as warm as those in close proximity to it."

The stove was described by Mr. E. A. Harman, of Huddersfield (who is always "up to date"), in "The Engineer" for Dec. 28, 1900, as one in which "no draughts are possible," and the "best gas-stove of its kind he had yet met with."

The makers of these fresh-air stoves tell me that the fires have not "taken on" for several reasons. Although they are economical in gas—using about 15 cubic feet per hour for an ordinary sized room; and strongly recommended by medical men—the first cost is high, and house owners object to the cutting through of the walls, &c., necessary for the fresh-air ducts. But the cost of gas when sold at 2s. per 1000 cubic feet and upwards makes the use of gas-fires very expensive.

In cold weather my bedroom gas-fires are lit about half-an-hour before the occupants retire to rest; and the whole of the bedroom is thus raised to a nice comfortable temperature and practically filled with fresh, warm moistened air. The air in the room never becomes vitiated, because communication between the outside air is maintained continually throughout the night, and there is thus no necessity to keep the bedroom window open.

The dread which the ordinary user of gas, however, has to the expansion of his quarterly gas account, and the difficulty of ascertaining how much of the increased cost is due to the use of gas-fires, have been two powerful reasons why this cleanly and healthy mode of heating has not been more generally adopted.

The last of these objections, however, as pointed out in your trenchant articles on this subject, has now been removed by the introduction of the discount meter; and the removal of the first objection it seems to me rests largely with gas managers and gas corporations. Given a cheap supply of gas, this healthy and convenient and cleanly mode of heating would be bound to become generally adopted, and would most certainly result in increased profits to the gas manufacturer.

In my own case, if I could get gas (say) at 1s. per 1000 cubic feet for my gas-fires, I should instal them throughout the house; and instead of having two gas-fires in use, perhaps for half-an-hour at night, I should dispense with coal-fires altogether, and have probably three fires going throughout the day.

I trust manufacturers of gas will be wise in their day and generation, and that your spirited efforts to assist your readers to see what are their own interests may be successful.

M.I.M.E.

Nov. 1, 1907.

Water-Works Distribution.

SIR,—Your correspondent "G. N.," in the "JOURNAL," for Oct. 29, p. 354, asking for information as to the sensitiveness of the Venturi recording apparatus when working under a low head of water, states that this is a "topic somewhat outside of distribution," and not included in the duties of the distributing engineer.

No doubt, there is great divergence of opinion as to the duties of the engineer in charge of the distribution department. The question rests entirely on the size and description of the works, and the number of the population supplied. If it is a small town of 1000 inhabitants or a town of 100,000, surely the outside superintendent or distributing engineer should be responsible for all the service reservoirs, filters, plant, apparatus, meters, recorders, gauges, mains, &c., requisite for securing an efficient, pure, and wholesome water supply and its proper distribution. Of course, he is carrying out the instructions of the engineer and designer of the works. He would bring in and post up daily all the diagrams of the automatic recorders, gauges, and meters, and report on the daily progress of supply, filtration, analysis, waste, extensions, &c.

Without the Venturi automatic recorders, the quantity of water required and registered to show the slip of pumps, waste of water used in sand washing, the proper working of the filters, with the automatic record of the rate of filtration, no works can be said to be efficiently under control and up to date. With these automatic recorders, the average quantity of water required is correctly determined; also the rate at which it is necessary to deliver it—not only the rate of consumption, but the temperature, rainfall, the health of the town, sanitary matters, and the duty of ascertaining the maximum rate of consumption at any hour throughout the year, so that mains of sufficient area may be provided and a proper pressure maintained, and all should be recorded and tabulated for future reference by the distribution department.

I hope that "G. N.'s" inquiry as to the indication of slight variations being recorded by the Venturi tube when working at a very small head when recording the rate caused by sand resistance in the filter-beds may receive a full reply. Such an illustrated description of modern filtering plant will be a valuable help to those having the care of water-works.

DISTRIBUTION.

Nov. 1, 1907.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Wednesday, Oct. 30.

(*Before Justices* PHILLIMORE *and* WALTON.)

Crossley v. Lee—Question as to a Gas-Engine being a Fixture.

This was an appeal by the plaintiffs from the decision of his Honour Judge Smyly, sitting at the Shoreditch County Court; and it raised the question whether a landlord had any legal right to destrain on a gas-engine bolted to a bed of concrete. The proceedings in the County Court were reported in the "JOURNAL" for May 21 last (p. 537). The plaintiffs (Messrs. Crossley Bros., of Manchester) let an "Otto" gas-engine to a Mr. Jones, the tenant of the defendant, residing at No. 449, Hackney Road. Jones sublet to a man named Fuller the portion of the premises he held, and then apparently disappeared. Fuller paid the rent to Jones; but as he did not hand it on, the defendant put in a distress on the premises, and distrained on the gas-engine, which was eventually sold at public auction. It was urged for the defendant that the engine was not a fixture when the distraint was levied, as an iron plate had been inserted between it and the bed of concrete. The learned Judge held that the distraint was made upon the engine, if it was capable of being distrained upon, and that the case of *Helliwell v. Eastwood* was an authority which compelled him to give judgment for the defendant.

Mr. HAMILTON, K.C., and Mr. SCHWABE appeared for the appellants; Mr. BEVAN and Mr. ABINGER represented the respondent.

Their LORDSHIPS, in reversing the decision of the County Court Judge, said it had been urged for the respondent that at the time the machine was seized by the landlord under distress for rent, it was a chattel, and as such distrainable; and if this had been so, the decision would have been right. But, on the other hand, if the engine was a fixture, it was not distrainable. In *Helliwell v. Eastwood* it was held that the machines seized were chattels, and did not pass with the mortgage as part of the freehold; and this decision the learned Judge had held was binding upon him. But there was a later case of *Hobson v. Gorringe*, which also related to a gas-engine attached to the land exactly as in the present case; and the Court of Appeal decided that the machine was a fixture, became part of the freehold, passed as part of the land, and did not pass as a chattel. The effect of this decision was that the law was not correctly applied in *Helliwell v. Eastwood;* and as they were bound by the decision of the Court of Appeal, they must hold that the engine in question did become affixed to the land so as to be part of the freehold, and consequently was not a distrainable chattel.

The appeal was allowed, with costs; but leave to appeal further was given.

QUESTION OF LIABILITY FOR GAS-WORKS MATERIALS.

In the Appeal Court on the 23rd ult., before Lord Justice Vaughan Williams, the President of the Probate, Divorce, and Admiralty Division, and Mr. Justice Bigham, an appeal was heard against a verdict and judgment in a trial by Mr. Justice Grantham and a Special Jury, in the King's Bench Division, a few months ago, as reported in the "JOURNAL" at the time (Vol. XCVIII., p. 1008). The plaintiffs

were Messrs. Gibbons Bros., Limited, and the original action was brought by them against the New Toddington Gas Company and Mr. John Chandler Hale to recover £126 14s. 7d., balance of an account for work done and materials supplied; the question being whether the Company or the co-defendant was liable. The case as stated for the plaintiffs was that Mr. Hale, in giving the orders to them, did so as the Company's agent; or, in the alternative, that he was acting on his own responsibility, and therefore was personally liable. The Company's case was that they entrusted Mr. Hale with the carrying out of the work for which the materials in question were supplied, and paid him, but that they did not authorize him to pledge their credit. The plaintiffs, on the other hand, said the Company applied to them for an estimate, and it was arranged that Mr. Hale should do the work and order the materials required. They knew nothing of any contract between the Company and Mr. Hale; nor were they told they would have to look to him for payment. All the orders were written on the note-paper of the Company; and the plaintiffs said that it was to them that they gave credit. Mr. Hale was called, and stated that he told two of the Company's representatives (one of whom was Mr. E. Eaton, the Managing-Director) that he had no money of his own with which to do the work; and he was told to get the goods from the plaintiffs. He had no idea of pledging his own credit. Mr. Eaton also was called, and stated that the Company made a contract with Mr. Hale, but gave him no authority to pledge their credit. In the result, the Jury returned a verdict for the plaintiffs for the amount claimed, and judgment was entered against both defendants. Stay of execution was, however, granted pending an appeal; and it was this that engaged their Lordships last Wednesday. It was contended by Mr. Shearman, K.C., representing the appellants, that no evidence had been adduced at the trial to justify the conclusion that Mr. Hale had any authority to pledge the credit of the Company; and he submitted that the learned Judge had entirely misdirected the Jury as to the real question at issue. Mr. M'Call, who appeared for the respondents, said Mr. Hale was regarded by them as the Company's agent; and he contended that they were justified in so doing by the fact that he was permitted to negotiate with them, of which there was evidence. Moreover, he was allowed to pledge the Company's credit. Lord Justice Vaughan Williams said he failed to see there was the slightest evidence of this; and the other learned Judges concurred. The appeal was accordingly allowed, and judgment entered for the defendants.

RATING APPEAL BY THE METROPOLITAN WATER BOARD.

At the County of London Sessions, held at Clerkenwell, last Wednesday, before Mr. Loveland Loveland, K.C., and other Justices, the hearing was resumed of the appeal, commenced towards the close of last year, of the Metropolitan Water Board against assessments by the Assessment Committee of the City of London Union, at the quinquennial valuation of 1905; the figures being the totals for 101 parishes in the Union. Before 1905, the parishes were assessed at £61,457 gross and £45,087 rateable value; at the last quinquennial valuation, the assessment was finally determined at £81,237 gross and £54,098 rateable value. The appellants asked that the figures should be reduced to £40,303 and £32,277 respectively. They said that before the changes effected by the Metropolis Water Act of 1902 there were ten bodies supplying water to London. These were now vested in the Board, who contended that all ought to be assessed as one enterprise. They were to be assumed to be the hypothetical tenant, and indeed were the only possible tenant; and they submitted that the rent they would give was to be arrived at by means of a percentage on the capital value. Mr. Danckwerts, K.C., Mr. H. Avory, K.C., and Mr. B. Houghton appeared for the appellants; Sir E. Boyle, K.C., Mr. Balfour Browne, K.C., and Mr. W. Ryde for the respondents.

At the conclusion of the evidence and the arguments of Counsel, Mr. Loveland Loveland said that, having consulted with the other members of the Bench, the three points he proposed to deliver their opinion upon were these: (1) That the undertaking should be treated as a whole; (2) that the calculation should be based on the accounts, and not on capital value; and (3) that the distribution should be taken on the recognized principles laid down by the Courts, on the ratio of gross receipts in each union or parish, so as not to amount to less than £32,277 in the City of London Union." A case would be granted to either party if they so desired it upon any of these points. With regard to the rateable value of the whole undertaking, he said the Bench had purposely not mentioned any amount, as it would have to be settled. However, there were other appeals, and they must settle in their own minds what was the rateable amount to be paid for the whole undertaking for all the parishes in all the unions. The question of the costs of this particular appeal ought to be reserved until all the parties had been heard. The other appeals are set down for hearing on the 25th inst. Mr. Balfour Browne intimated that he should ask for a case to be stated on two points: (1) Whether it is right that the undertaking should be taken as a whole; and (2) if it is taken as a whole, the distribution should be in the ratio of gross receipts or net receipts.

Incandescent Mantle Litigation.

The action of *Sherwell v. Combined Incandescent Mantle Syndicate, Limited, and Others*, was in the list for hearing before the Master of the Rolls and Lord Justices Moulton and Farwell on Oct. 26; the appeal being by the plaintiff from a decision by Mr. Justice Warrington to refuse to grant an injunction. On the case being called, Mr. Boome said the appeal was in the list by mistake, as the order of the Court below had not been completed; and he asked for an adjournment. The Master of the Rolls declined to allow it; pointing out that the case was heard by Mr. Justice Warrington in May last, and that there had been plenty of time to complete the order. He strongly objected to parties delaying matters in this way. Mr. Boome urged that the delay was caused through the parties trying to compromise their difficulties, and so avoid any further hearing. Their Lordships said they must go on with the appeal. On Counsel stating that they were not prepared to proceed, the appeal was dismissed, with costs.

MISCELLANEOUS NEWS.

WEST SUBURBAN AND UXBRIDGE GAS ARBITRATION.

The Value of the Colnbrook Gas-Works.

At the Surveyor's Institution, Westminster, on Thursday, arbitration proceedings were commenced to determine the price to be paid by the Uxbridge Gas Company for the gas undertaking at Colnbrook. By section 7 of the Uxbridge Company's Act of 1906, they undertook to purchase the works of the West Suburban Gas Company, by agreement or arbitration, before they began to supply gas in certain parishes.

Mr. CORBET WOODALL acted as Umpire. Mr. E. H. STEVENSON was Arbitrator for the Uxbridge Company, and Mr. HORSEY (Messrs. Fuller, Horsey, Sons, and Gassell) for the West Suburban Company, the claimants.

Mr. FREEMAN, K.C., and Mr. ALEXANDER NEILSON appeared as Counsel for the claimants; and Mr. HUTCHINSON and Mr. GRAHAM MOLD represented the Uxbridge Company.

Mr. FREEMAN, in opening for the claimants, said the question to be decided was the amount to be paid for their undertaking by the Uxbridge Company. The works at Colnbrook were fairly good. They belonged for many years to a private individual, and were afterwards acquired by a firm of promoters named Darby and Co., who considerably improved them. They acquired the undertaking in April, 1905, at which time it was only supplying in a very limited way houses in Colnbrook itself. It apparently had not been pushed with any particular kind of energy. Even in Colnbrook there were comparatively few people on the register of consumers. Messrs. Darby and Co. found that there were a considerable number of parishes and places within easy reach of the gas supply from Colnbrook which were not under the powers of any company; and they then proceeded to canvass the neighbourhood, and received an exceedingly favourable reply. About 800 persons said they would be prepared to take the gas if it were brought to them. They also entered into communication with the local authorities of the various districts, who said they would be very glad to have the gas brought into their districts, and would give every facility for the carrying through of the mains. Messrs. Darby and Co. then proceeded to form the West Suburban Gaslight and Coke Company. A prospectus was issued; and they proceeded to make calculations showing what the prospects of the Company would be and what would have to be paid. He did not suggest that the details of the prospectus were to be taken as gospel truth; but there was a certain amount of hope about every prospectus, and he did not think it went beyond the terms of an ordinary prospectus. The Company was incorporated on June 22, 1905; and the public subscribed very substantially. There were 173 shareholders; and the public subscribed to the undertaking on the faith of the statements made. The actual purchase money for the undertaking was £11,750—the purchase money paid to Messrs. Darby and Co. by the Company in hard cash. The Company took possession on Aug. 10. The £11,750 did not represent all the expenditure made by the Company, because as soon as they got possession they proceeded to bring the undertaking up to date, in order to earn the money they expected to come from the sales. They had contracts for £1385 for new gas plant, of which they had actually paid over £1000 to Messrs. Lund. They also purchased some land at Colnbrook for an additional gasholder or other plant, which cost £314; they improved the existing buildings at a cost of £53; they spent on their mains account £813, and on their plant account, £4 16s. Their entire expenses in respect of the passing of the Uxbridge Gas Bill were only £100. Therefore, in round figures, they had spent, beside the £11,750, very nearly £3000. This was the condition of things when the Uxbridge Gas Company appeared upon the scene. The claimants immediately communicated with the Uxbridge Company, stating that they were dealing with a district part of which was included in the notice of supply by the Uxbridge Company, and unless some arrangement were made with them to exclude their district they would have to oppose. The Uxbridge Company would have nothing to do with them; and thereupon they appeared in the proceedings before the House of Lords. It was there intimated that Uxbridge was quite prepared to buy them out; and thereupon the clause was introduced and inserted in the Act of 1906. The result of this was that the Uxbridge Company had to buy the undertaking of the West Suburban Company at a price which came before this tribunal to be decided by arbitration. In order to carry out the sale, a Liquidator of the Company was appointed on Sept. 15, 1906; and he was the official representative of the Company in these proceedings. The Company had two assets; they had gas-works which were not up-to-date and required money for considerable extension, and, on the other hand, they had promises of customers. They had a business undertaking and promises; and there could be no reasonable doubt that if they supplied gas at a fair price people would have taken it, though there was no binding contract. But there were customers, and there was value in the undertaking if properly developed. He was not in a position to say that in their opinion £11,750 actually represented the value; he could not say that this was not a higher price than the undertaking was worth. They did not know until afterwards that the actual price paid by Messrs. Darby and Co. for the works was £500; but whatever happened in this arbitration there had been great hardship on people who had subscribed money paid over in cash to Messrs. Darby and Co., and for which unquestionably they had not got their money's worth. The claimants calculated on two factors—first of all, a substantial increase of the output of gas, and, secondly, a substantial outlay before they could earn the result of the output. The calculation they made was that if gas was supplied after the proper works had been put up, the Company would have been enabled to have an output of about 6½ or 6¾ million cubic feet per annum; and in order to do this they were assuming that, instead of charging the full prices they were entitled to charge, the Company would be charging 5s. per 1000 cubic feet for ordinary and 5s. 6d. for slot-meter consumers. The present price was 5s. 10d.

and 6s.; but they would be charging on the larger area only 5s. and 5s. 6d. In order to arrive at what the financial result would be, Mr. Hunt and other witnesses he would call had made calculations as to the cost of coal and materials, coke, and residual products, &c. The result of this was, from their point of view, that a credit balance representing maintainable profit would be obtained of £798 or £800. Then came the question of capitalization. It would not be reasonable or right to deal with prospective profits as if they were dealing with actual works and consumers; and it was therefore thought that fifteen years was a fair multiplier to take. The sum of £798 multiplied by fifteen years gave £11,970. Before this could be obtained, a very substantial outlay had to be made; but the total figure resulted in £6315 expenditure. This gave a compensation for the undertaking of £5655. This being a proceeding under the Lands Clauses Act, they were clearly entitled to 10 per cent. beyond this, £565, which brought out a total of £6220.

Mr. *A. Edwards*, a chartered accountant and liquidator of the West Suburban Gas Company, stated that the Company was acquired from Messrs. Darby and Co. in April, 1905. The firm consisted of Mr. Darby and Mr. H. W. Gyde, trading as Darby and Co. The purchase price was to be payable to the vendors—20 per cent in cash and the balance in fully-paid shares, or cash at their option. The vendors took the full amount of their purchase price in cash—£11,750. The Company took possession of the premises on Aug. 10, 1905, so far as he was able to ascertain. They continued to work and to make improvements, and incurred certain expenses. As regarded the gas plant, there was a contract entered into by the Company with Messrs. Lund Bros. for £1165. The sum of £1000 had been paid under this contract. There was further land acquired at Colnbrook; and it was part of the agreement that all the vendors' costs should be paid by the Company. Improvements were made by the Company, and further expenses incurred in connection with mains, &c.

In cross-examination by Mr. HUTCHINSON, witness said that he was Auditor of the Company prior to being Liquidator; but his name did not appear on the prospectus.

Mr. HUTCHINSON: I put it to you plainly that it was a fraudulent prospectus—that the people who framed it are knaves and cheats. You do not deny it?

Witness: I don't think I am called upon to answer such a question. I have only known Messrs. Darby and Co. since I was appointed Liquidator.

In reply to further questions by Mr. HUTCHINSON, witness admitted that he knew from the contract of what members the firm consisted. He did not know at the time that Mr. Gyde, one of the vendors, on April 25, 1898, was convicted at the Old Bailey, and sentenced to five years' penal servitude. He did not know that Directors mentioned by Counsel were intimate friends and associates of Messrs. Darby and Co. He came in quite as a stranger. He had known Messrs. Darby and Co. under other names.

Mr. HUTCHINSON: Do you know that they have promoted the following bogus Companies—the Welsh Slate Quarries——

Mr. FREEMAN objected to such questions being put to witness.

Mr. HUTCHINSON: The foundation of this case is a contract entered into between people who are called Messrs. Darby and Co., who have received £11,750, and the unfortunate shareholders who have been swindled.

Mr. FREEMAN said he had stated fairly that he could not support the £11,750, and he had stated that, quite apart from what was paid for it, the undertaking was worth £6200.

Mr. HUTCHINSON rejoined that his learned friend had rested part of his case upon prospective outlook. He was entitled to show that the prospective promises were untrue—that many of them were fraudulent; and he would put in witnesses who would tell the tribunal that they had never signed any document of the kind. He was entitled to put to them the whole facts relating to the inception of the documents, and which were not *bonâ fide* documents.

Mr. FREEMAN: But that does not affect the case one jot or tittle.

The UMPIRE: I think it does; and if it is shown that the promises were not really given, it would be an important element.

Mr. HUTCHINSON: You know nothing of the Welsh Slate Quarries. Now as to the Kent County Gaslight and Coke Company. Do you know that Messrs. Darby and Co. promoted that?

Witness: I have heard it as a matter of gossip.

Continuing, witness said he had read the prospectus as Liquidator, and as Auditor of the Company at the time. He had read in the Press something to the effect that Mr. Justice Joyce had said that the prospectus was a most cunningly devised document, and that the bringing out of the Company and palming it off upon the public was nothing better than a swindle. He asked that he should not be requested to say anything which might prejudice his position. He had been advised that the Company could develop into one having sales from six to six and three-quarter million cubic feet; and he had seen the statement that they would have an output of 30 million cubic feet. It was not his business to understand plans, and he was not prepared to make any comment on the prospectus. He had got the requisitions, and produced them. He believed they were obtained before the purchase of the Company; but he could not admit that they were obtained for the purpose of swindling the public.

Mr. HUTCHINSON: You yourself have no proof that any signature upon any documents was written by the person by whom it purports to be written?

Witness: Yes, I have.

Will you point me one out that you can prove?—Mr. Belch.

It is upon Mr. Belch's signature that the £6000, or the larger part of it, is based?—I don't know.

In reply to further questions, witness said he believed the number of signatures on the requisitions was about 798. He did not know that out of these signatures there were 183 names of women who were the wives of occupiers, nor did he know the number of people who could not write was 76 on the requisition. He was informed that it was not the case that, out of the total number of 798, 204 of them were within the statutory area of the Uxbridge Gas Company; but he did not know personally. Mr. Belch informed him; and he had been through it. He was not aware that 167 were in the district of the Slough Gas Company, and that a large number of them were occupiers of houses in streets where the gas-mains had been down for the last thirty or forty years. He knew nothing as to the Directors being practical men. He had never prepared a balance-sheet for a gas company before, whether in or out of liquidation. Messrs. Darby and Co. had not purchased a single share.

Mr. HUTCHINSON put to the witness the names of Directors and others who held no shares, and asked if, with the history of the inception of the Company, witness thought, from his experience in financial matters, there was any likelihood of getting a single further farthing of capital from the public; and witness replied that, had the Uxbridge Company not intervened, it was quite impossible for him to say what would have occurred.

In re-examination by Mr. FREEMAN, witness said his action in this matter was purely an official one of being at one time the Auditor and another the Liquidator. He had no part in the making of contracts or the management of the Board. So far as this claim was concerned, he was entirely guided by experienced men. He knew nothing about the contents of the prospectus beyond finding out whether the figures were accurately set out.

Mr. *Charles Hunt* then gave evidence, and said he knew the locality in which the works belonging to the West Suburban Company were situated, and also the surrounding district. He had visited and inspected both the works and the district for the purposes of the arbitration. The area now occupied by the works was about 547 square yards. As seen to-day, the works consisted of a retort-house, containing two beds of three retorts each, and a coal-store adjoining; condenser, washer, scrubber, and purifier; two single-lift gasholders, having an aggregate capacity of about 17,700 feet; and a 3-inch beam governor. There were also a well for water supply, and underground tar and liquor storage tanks. The larger of the two holders, having a capacity of about 11,000 cubic feet, was erected upon the newly-acquired ground, and had not been connected up. There were also a gas-engine and exhauster, station meter, and 6-inch governor, all fixed on foundations, but not yet connected up. His detailed valuation of the works and plant showed the present value of the land, buildings, and plant, assuming the land to be worth £450, to be £2013; mains and services, £715; and meters, £66—giving a total of £2794. It was the intention of the Company to complete the alterations and additions that had been undertaken, and also to provide a second purifier; the reason given for the work having been left incomplete being the arrangements for the sale of the undertaking to the Uxbridge Company. With the completion of the work as contemplated, and with the addition of larger condensers, scrubber, and connections, and the 6-inch outlet main from the governor continued into the High Street, the works should be quite capable of producing and delivering about 4½ million cubic feet of gas per annum, or the equivalent of a sale of fully 4 million cubic feet, allowing for a loss in distribution of (say) 6 per cent. This quantity could be increased to about 7½ million cubic feet by adding to the number of retorts, for which there was plenty of room, enlarging all connections to 6 inches, and providing 6-inch condensers, larger scrubber and purifiers, a duplicate exhauster and engine, and telescoping the new gasholder. There being no station meter in use, it was not possible to say how much gas was at present produced; but the total sales for the year ended June 30 last were 886,000 cubic feet. This included the supply during part of the year to 23 public-lamps. There was not, in his opinion, the slightest doubt that this quantity could be greatly increased by proper attention to the business, which appeared to have been much neglected. It was contrary to the general experience that there should be so few consumers as only one out of every five or six of the occupiers of premises, and that among even so small a number as fifty consumers there should be only one cooking stove in use. On the line of the existing mains, there were 276 tenements of all kinds, and in addition there were in Stanwell and Horton 222 and 87 respectively—making 585 in all. These consisted largely of cottages suitable for slot-meter consumption. There were also quite a number of shops, more particularly in Colnbrook, and two or three manufactories. Most of these were on the high roads. There were a few farm houses at short distances from the high roads, and also several mansions with entrance lodges, stabling, &c., which were at present lighted either by electricity or acetylene. Assuming the charges for gas to be 5s. and 5s. 6d. per 1000 cubic feet to ordinary and slot-meter consumers respectively, instead of as at present—5s. 10d. and 6s.—he estimated that in these three parishes a consumption of upwards of 6½ million cubic feet per annum might be expected. The expenditure that would be required on works, mains, meters, services, and prepayment fittings, in order to secure this consumption, would be about £6315. As a basis for arriving at the present value of the undertaking, he had prepared a revenue account showing the profit that might be expected from a sale of 6,642,000 cubic feet of gas per annum at the prices named. In this account he had taken 19s. 6d. as being a fair average cost per ton for gas coal delivered into the works. After alluding to items of wages, repairs, meter and stove rents, &c., witness said he arrived at the result of a credit balance of £798, which would be, in his opinion, maintainable profit. In any ordinary case of purchase of a non-statutory gas undertaking the amount of maintainable profit multiplied by 19½ or more years, as the case might be, would represent the value of the undertaking, *plus* the value of any surplus plant and *minus* that of any which might be deficient. In this case there were only potential profits to go upon, and the number of years' purchase would be less than in a case where the profit had actually been made. He considered 15 years' purchase of the estimated profits as the value of this undertaking, less certain expenditure on works, mains, &c., and *plus* 10 per cent. for compulsory purchase. This worked out as follows: The sum of £798 multiplied by 15 years, £11,970; deduct expenditure on works, mains, &c., £6315—leaving £5655. To this he added 10 per cent. for compulsory purchase, £565; making a total of £6220. This calculation was entirely dependent on the past history of the Company.

In reply to Mr. HUTCHINSON, witness said the assumption on which he arrived at the capital sum was that 6 million cubic feet of gas could be sold in two years' time. Some of the old mains had been renewed. As regarded the proportion of mains put to "repairs" and the proportion to "capital," he should only put the proportion which represented the

increased carrying power of the main. He had not calculated what was the proportionate cost out of the total figures for the renewals of mains that ought to be charged to revenue account from the books of the Company. He had valued the undertaking just as it existed. He never knew of prospective value to be given for a non-statutory company; but these were very exceptional circumstances. He would not say that this Company were in a position to earn profit with their present output.

In re-examination by Mr. FREEMAN, witness said that when he approached this question he was fully aware of the condition in which the Company had been carried on up to two years ago; and he was aware that, owing to mismanagement, the Company had not been doing anything like they ought to have done. In his experience, in dealing with non-statutory companies, he found that each company must be taken with the surrounding circumstances of each case.

Mr. STEVENSON: In a district like this, with the price of gas which you propose to charge—5s. per 1000 feet and 5s. 6d. for slot meters—what proportion of the householders do you expect to get as customers?

Witness: I think it works out at something like 80 per cent. There are over 90 per cent. at the Garden City, at Letchworth.

On the resumption of the proceedings on Friday,

Mr. *R. Bruce Anderson* stated that most of his experience had been among small gas-works, and to a considerable extent undertakings of the character they were now dealing with. The circumstances under which he made his valuation were very unusual. This undertaking had supplied gas in a way for over forty years; and from what he saw of it, it was quite evident it had been starved. There had been no enterprise. It was, in his opinion, a desirable neighbourhood from a gas company's point of view. He believed that if there had been capital and energy brought to bear upon the undertaking, it could have been developed. Witness was proceeding to give the details of an estimated consumpton of 6¾ million cubic feet of gas per annum, with a figure of £783, including the districts not within a statutory company's district, when

Mr. FREEMAN stated that he would not trouble witness further. The tribunal would understand that this had been an extremely difficult case to conduct. He was sorry for the people he represented, because they were absolutely innocent people, who, like the person mentioned in Scripture, had fallen among thieves; and there was not the slightest doubt that the price they paid for the undertaking was out of all proportion to its value. As would be seen, of course, the duty of the Liquidator and himself was to do the very best they could for the people who were in such an unfortunate position. They were not in the position which one generally was in in these cases—and liked to be in—of having works which were in a proper condition and having a *clientèle* paying a great revenue. Therefore they had had to do the best they could, without pressing the matter, and with the best expert advice they could obtain, to see what the probable future income of such a company would be. But he had felt all through that there were many great difficulties in the way—that the works were undoubtedly not in a proper condition, that further capital would have to be raised, that there might or might not be questions with the local authorities, who could practically have stopped the development if they had chosen to do so; and a great many things had been brought to their knowledge, owing to the cross-examination of the previous day, which had made them modify their position very considerably. Under these circumstances, of course, one had to take a certain amount of responsibility, and he had advised his client that, in the position of Liquidator for the Company, he could not afford to run any risk whatever of being put into a worse position than he could save him from; and whether right or wrong, he was obliged, under the circumstances, to accept the sealed offer which had been made in this case of £1808. And there was a private arrangement between his learned friend and himself—not anything which the Umpire would have to take into consideration, but an arrangement by which assistance was given to these unfortunate shareholders in respect of the costs of this inquiry. He was bound to say it had been an extremely difficult case for all the parties concerned, because they were in ignorance of a great deal which had been brought out now; and it was quite probable, if they had known all that they now knew, they might have taken a different course at an earlier stage of the proceedings. He hoped the tribunal would consider that the Liquidator's sole concern was to do his best for the shareholders; and that those who had advised him had acted wisely.

Mr. HUTCHINSON said he agreed with the remarks Mr. Freeman had made. His feelings at the present juncture were somewhat mingled. He was glad at the result in the interests of the unfortunate shareholders, who undoubtedly had been cheated and swindled by this gang of bogus company promoters and company swindlers. Of course, they had been robbed, and they felt sympathy with them from this point of view; and that was what made them give such a big sealed offer. But there was no reason why if Paul was robbed Peter should be robbed to pay him. This was why they had acted on principle, and had felt bound to resist the claim and thus expose this scandalous swindle. He thought they had been of some assistance to the shareholders, because they now appeared to have put the Liquidator into the possession of damning facts which were probably not within his knowledge before; and he was quite sure, as the Liquidator had told them that these facts were not within his knowledge, he would take the earliest opportunity of further elucidating the facts; and he said that it was his duty, as an officer of the Court, to put the matter into the hands of the Public Prosecutor, in order that these cheats and swindlers and rogues, who had swindled poor people out of their money, should meet with the punishment they deserved. From what Mr. Freeman had said, the Umpire would give his award for the sum of £1808; and everything consequent in regard to the fees upon the award and everything else would follow the provisions of the Lands Clauses Act. The arrangement Mr. Freeman had mentioned would, of course, be a private one.

The UMPIRE: I should be glad if you would guide me a little as to the form of the award, especially in regard to costs.

Mr. HUTCHINSON: You have nothing, Sir, to do with costs.

The UMPIRE: That you arrange?

Mr. FREEMAN: It is under the Lands Clauses Acts.

Mr. HUTCHINSON: All you will have to find in the award is, if you choose to recite, that the sealed offer, amounting to the sum of £1808, was accepted. It is arranged that you should award this sum.

The UMPIRE: I would like to say that I sympathize with every word that Counsel have said on both sides; and I am sure my friends the Arbitrators do also. They feel the deepest sympathy with the shareholders; but at the same time they feel it was absolutely the duty of the Uxbridge Company to bring this case into Court rather than settle it. With regard to the amount of the award, I may, for the satisfaction of the Liquidator, express my feeling that, in view of what we have heard already, the settlement is not an unfavourable one to his clients. May I say also that, having regard to the circumstances in which Mr. Edwards was placed, I think he put the case before the tribunal as fairly and as fully as he could.

Mr. FREEMAN: I am sure it will be a great satisfaction to the shareholders to know of the settlement.

The proceedings then terminated.

RECENT GAS COMPANY PROMOTIONS.

Sale of the Goudhurst Gas-Works.

In accordance with the announcement which appeared in the "JOURNAL" for the 8th ult., the Goudhurst Gas-Works of the Kent County Gaslight and Coke Company, Limited, now in liquidation, were sold by auction at the Swan Hotel, Tunbridge Wells, by Messrs. Brackett and Sons, on the 25th ult. The works, which are freehold, and the manufacturing and storage plant, together with the mains, meters, stoves, &c., were disposed of as a going concern. The quantity of gas sold during the year ending June 30 last, was 2,700,000 cubic feet. In answer to a question, the Auctioneer said no powers existed for laying mains, and that to obtain them would cost about £300. A gentleman stated that he was for twenty years a shareholder in a Company that formerly owned the works, and during that time he never had a dividend. Another expressed the opinion that the works were cramped for space, and wanted to know the quantity of gas made and also the leakage. In reply, the Auctioneer said the station meter had been tested and found to be fast, that the leakage was about 20 per cent. of the make, and that 305 tons of coal were carbonized during the year. The largest consumer (Judge Stirling) used a little more than 500,000 cubic feet of gas. The book debts of the Company were not included in the sale; but the books would be handed over to the purchaser of the works. The first bid of £300 was promptly followed by others of £400, £500, £550, and £600, from which amount the biddings proceeded by bids of £25 to £1250, for which sum the works were sold.

Failure of a Promoter of the Kent County Gas Company.

At the London Bankruptcy Court last Tuesday, the first meeting of creditors of Mr. Henry Warwick Gyde was held. The Official Receiver (Mr. G. W. Chapman) reported that the debtor was a member of the firm of Darby and Co., who had promoted various public companies; among the latest being the London and Hull Soap Works Limited. The firm purchased freehold works in Hull from Messrs. Harrison and Walker, the petitioning creditors, for £8750, payable as to £250 in cash and the balance by way of mortgage on the property, on the understanding that the mortgage was to be transferred to the Company when formed. The mortgage, however, was never transferred, owing to delay by solicitors and disputes between the Directors. The petitioners claimed in respect of interest due on their mortgage, which interest, the debtor asserted, was really payable by the Company. As a member of the firm of Darby and Co., the debtor was under a liability of £60 for money lent; he had been sued on this debt, and judgment had been obtained, upon which these bankruptcy proceedings were based. In reply to the Chairman, the debtor said they had done very little business lately; it had failed through want of capital and quarrels among the Directors. He was unable to submit any offer. He had not made any money for about a year, and the present and other litigation had prevented him from meeting the small amount of his liability. The case was left in the hands of the Official Receiver, to be dealt with in the ordinary course of bankruptcy.

EXPANSION OF THE DERBY GAS COMPANY'S AREA.

Successful Negotiations for Taking over the Belper Gas Supply.

Annexation of new territory is of the policy of the Board of the Derby Gas Company, whose progressiveness under the management of Mr. J. Ferguson Bell has made history for the undertaking.

Meeting last Wednesday members of the Belper District Council had their attention directed by the Chairman (Alderman G. Herbert Strutt, J.P.) to a development foreshadowed in the following minute (see also *ante* p. 50): "This Council realizing the advantages to be gained by the town and neighbourhood in the adoption of the recommendations contained in their Committee's report, would be pleased to hear as soon as possible from the Directors and shareholders in the Belper Gas Company if they are prepared to enter into negotiations with the Derby Gas Company on similar lines to those indicated in their report." The Chairman said permission had been given him to announce that the Belper Company had come to terms with the Derby Company; and he was in the happy position of being able to say that he also had come to terms with them in connection with his own works at Milford. Both businesses would be taken over by the Derby Gas Company on Jan. 1 next. He thought this would be an announcement which would give a great deal of satisfaction to the town, and it was a very satisfactory way out of the difficulty. No one would be the worse off, while consumers of gas would be considerably better off, and the non-consumers of gas would have no extra burden put upon them, which would have been the case had the business been taken over by the town. The Committee had shown a grea. deal of tact in handling this delicate matter; and he was personally grateful to them

for having gone into the matter in the manner they had done. He was perfectly satisfied with the way the Derby Company had treated him. He was glad to get rid of the business, as it had caused him great anxiety at times.

Commenting on the matter, the "Derby Express" says: "It has been announced by Mr. Herbert Strutt that a successful termination has been reached in the negotiations for the union of the Belper gas undertaking with the Derby Gas Company. This is not a case of the Derby undertaking grabbing at Belper, but of Belper begging to be taken in. The Belper Gas Company, with the approval of the District Council, which evinces no desire to make gas a municipal enterprise, has come to terms which are satisfactory to all concerned; and Mr. Strutt is not only willing but glad to be relieved of his gas-making undertaking. Judging from the proceedings at the meeting of the District Council, everybody at Belper is pleased. Nobody will be the worse off, gas consumers will be the better off, and non gas-consumers will have no risks arising out of municipalization."

THE PRICE AND PURCHASE OF STOCK.

In the current number of the "Co-Partnership Journal" of the South Metropolitan Gas Company, the above subject is dealt with in an article by Sir George Livesey, from which we make a few extracts. Sir George begins by remarking that his subject is an extraordinary one for an article in a journal largely read by working men, and written specially for their information; and he acknowledges that not many years ago it would have been entirely out of place. But an extraordinary change has been effected in the circumstances of those addressed, which has made the price of the Company's stock a matter of much interest to the workmen; and as many inquiries are made, at the time of the annual bonus distribution, as to the price at which stock will be transferred, he thinks information on the point will be both useful and welcome. He proceeds to give it, as follows.

It is our wish to transfer the stock to the employees at, or if possible a little below, the market price at the time. But this is not at all an easy matter, and causes much anxiety, especially to our good friend Mr. Bush, who manages this business, consulting me when in doubt; and I can assure you we sometimes do not know what is best to do. A large amount of stock is wanted. This year we have to invest about £40,000; and at least £33,000 of stock is required. The odd £3000 is, perhaps, obtained by small purchases week by week throughout the year from consumers and employees at varying prices according to the market. The market price of stock of all kinds, from the best to the worst, is always changing more or less. Many causes are constantly at work—some being understandable and some not at all clear. Some changes in price are due to public and national, and even international, causes; while others are due to private reasons, such as a number of buyers, which puts up prices, or sellers, which reduces them; war, briskness and slackness of trade, over-speculation here or abroad—say, in America—and many other obscure influences which cannot be explained. These fluctuations in the value of all stocks cause constant anxiety to those owners of property who watch the markets. Many stockholders, when they see the price of their stock going down, are afraid it will go lower and give orders to their stockbrokers to sell, with the result that this selling causes a further drop in price, which brings into the market another lot of frightened sellers and a further drop ensues; and th en some cool-headed, shrewd people notice the low price and begin buying, and thus the rot is stopped. An old stockbroker, whom I greatly respected for his honesty and straightforwardness, said to me some years ago: "The public, as a rule, sell when stocks are cheap, and buy when they are dear." When markets are rising, the ordinary public think prices will go higher and higher, and then rush in to make purchases in the hope of selling at a profit—a hope very often not fulfilled. It is the cool-headed, shrewd men, with good general knowledge of the market and of the companies in which they invest, who profit by the mistakes of the ignorant public. I must say that this way of making money by speculation is not one to give satisfaction at the close of life. The successful speculator gets rich, but it is often by others being made poor; and it cannot be a pleasant thought that one's wealth has been derived from others who have got nothing in return. There is no doubt that more persons lose than gain by speculating, and it is best not to speculate. Do your best to find a good sound investment, and put your money in it and keep it there. Do not worry about the ups and downs of the market, which are sure to come, although the dividend may be regular and quite safe. This is the case with gas stock, which gives a regular but moderate dividend as safe as any others, with less fluctuation in the market price than happens with investments generally.

All businesses, in addition to the general reasons for variations in the market price, are also affected by their own special circumstances. Railway stocks have been lately depressed by the threat of a strike, and gas stocks generally have this year been reduced in consequence of the high price of coal, which bas necessitated an increase in the price of gas, and a consequent reduction of dividend for a time—I hope a short time only.

The price of the Company's stock at which it has been transferred to co-partners for the last five years has been:—

1902	£123	os.	for £100,	or £12	6s.	for £10
1903	121	10	,,	,,	12	3	,,
1904	123	0	,,	,,	12	6	,,
1905	131	0	,,	,,	13	2	,,
1906	131	0	,,	,,	13	2	,,
1907	120	0	,,	,,	12	0	,,

The reduction in the price of stock this year is due partly to general causes, which have had an adverse effect on all stocks, and to the increased price of gas. These various prices explain a rather puzzling question. We do not issue certificates for less than £10 of stock, which at this year's price would cost £12. But many men have not enough bonus or savings in one year to take up £10 of stock; therefore their half bonus is every year invested for the owner's benefit in the names of the Trustees, the owner being credited with the dividend. Suppose this half bonus amounted to £4 7s. 4d. a year in 1905 and 1906, and invested by the Trustees at the prices in the above table for those years. This year the price is lower; therefore, instead of £4 7s. 4d. being wanted to purchase the remaining third part of the £10 share, as we may call it, £4 is sufficient, when the account stands thus:—

1905 to purchase one-third of £10 share	£4	7	4
1906 ,, ,, ,,	4	7	4
1907 ,, ,, ,,	4	0	0
Total	£12	14	8
In 1905 the cost of a £10 share was	£13	2	0
In 1906 ,, ,, ,,	13	2	0
In 1907 ,, ,, ,, is	12	0	0
Divide by 3)	£38	4	0
Average	£12	14	8

This year, therefore, seems a favourable time to buy; but I never give advice about buying stock, preferring simply to state the facts as far as I know them, leaving the decision to the judgment of the investor.

These variations in the market price are the difficulty with which Mr. Bush has to deal. It is impossible to buy £30,000 at any one time in the market except at an outrageous price. If Mr. Bush were to wait until August, and then went into the market for £30,000 of stock, the only result would be an immediate and serious advance in price. It is, therefore, necessary to begin buying, as it is offered at the market price, six or eight months before it is wanted, but the price at Christmas may be, and often is, very different from that in the following August. In January last the price was about £130, and it gradually came down to £120 in August. In January we began to think that the price of gas would have to be increased; therefore some fall in the value of stock was expected. This proved true, and Mr. Bush had to buy all through the half year on a falling market. He was, however, very careful in his buying, and had about £12,000 to buy in August, when we had to settle the price for the co-partners. How and when and at what price to get this £12,000 was the difficulty, and this uncertainty compelled us to name 122½ as the price, which was about £2 10s. above the market price. But, considering the circumstances, I think it was very good. Fortunately, however, sellers of stock appeared, and week by week considerable amounts were offered, until at last the whole £12,000 has been obtained at about £120; and I am glad to say we have been able to fix the price for co-partners at that figure—the middle figure of the present market price, £119 to £121. We could not quite have done so but for a balance of about £900 in hand on the withdrawable account. . . . When we purchase on a rising market there is no difficulty except that of finding sellers; but no promise can be made that the price at which the annual bonus is invested shall not exceed the market price. We will do our best to keep it down; and I suggest that, in accordance with the principle of co-partnership, the heavy responsibility that falls on Mr. Bush should be shared by the appointment by the Co-Partnership Committee of some workman with a good head for finance to act with Mr. Bush and myself in the buying of stock.

SOUTHAMPTON GAS COMPANY.

Half-Yearly Report.

The report of the Directors for the half year ending the 30th of June has been issued. They state that the profit and loss account shows that, after payment of debenture interest and all other charges, the amount available for dividend is £16,029; and they recommend the payment of maximum dividends, amounting to £12,854 for the half year, on the ordinary stock, less income-tax. This will leave a balance £3175 to be carried forward. There was the satisfactory increase of 13 million cubic feet of gas sold during the half year, compared with the first half of 1906; and the Directors are pleased to report a marked improvement in the sales of residual products. The number of prepayment installations has now advanced to 14,800; being an increase of 800 for the half year. The demand for gas under this system is stated to continue highly satisfactory. During the six months there was also a gratifying increase in the number of cookers let on hire, together with an appreciable addition to the consumers under the ordinary system. Gas-fires remain in great request. With the object of still furthering the supply of gas in this direction, the Directors are making arrangements for letting on hire, and fixing free, gas-steam radiators; and extended business therefrom is anticipated. In conclusion, they state that the Company's works (under the supervision of Mr. S. W. Durkin, the Resident Engineer) have been maintained in an efficient condition, and are fully equal to meeting this winter's demand for gas.

CEARA GAS COMPANY, LIMITED.

Another Increase in the Dividend.

The Annual General Meeting of this Company was held on Friday, the 25th ult., at the London Offices, No. 9, Queen Street Place, E.C. —Mr. J. DARELL BLOUNT in the chair.

The SECRETARY (Mr. George R. Guyatt) read the notice convening the meeting and the Auditor's certificate. The report and accounts were taken as read. The report stated that the result of the working for the year ended June 30 was a net profit of £7446, which, added to the balance brought forward, gave a total of £10,574. Deducting the interim dividend paid in April last (£1688), there remained £8886 available for division. Out of this sum, the Directors recommended the payment of a dividend for the six months of 5 per cent. on the preference shares and of 4 per cent. on the ordinary shares, which would absord £1988, and leave a balance of £6898 to be carried forward. The Directors regretted to report the death of Mr. Magnus Ohren, who had been Auditor of the Company since 1891.

The CHAIRMAN said that the Board had very great pleasure in again meeting the shareholders to present the report and balance-sheet for the year to June 30, which they thought would be found satisfactory. The accounts were set forth in such full detail that very little explanation was needed from him. They would notice that the expenditure on coal was rather larger than the previous year; but, on the other hand, there had been more gas produced and paid for. There was one item in the accounts which had an unpleasant appearance, and that was exchange, on which the charge to the Company's debit was some £1800 greater than was the case in the preceding year. This was owing partly to the remittances to England being rather more; but it principally arose from the difference in the rate of exchange, which for 1906 was taken at 16½d., and had now fallen to 15½d. This, of course, was a matter which was quite outside any control which the Directors might have over the accounts. He was pleased to say that the dividend they were now able to recommend was 1 per cent. larger than that paid in the previous year. In 1906, they divided 6 per cent. on the ordinary shares; and this year it would be 7 per cent., with the usual 10 per cent. upon the preference shares. The amount carried forward was somewhat large; but they had to bear in mind that from the sum named in the report had been deducted a certain amount to provide for the reserve fund, in order to protect the debenture holders, as before very long these debentures would be falling due, and the Directors must have the needful money in hand to meet this liability. He concluded by moving the adoption of the report and accounts.

Mr. F. A. WALLROTH seconded the resolution.

Mr. CHARLES WEBB asked the present price of gas at Ceara.

The CHAIRMAN said it remained at a uniform price Under their concession, they could not alter the charge; it was the same throughout the year. The price was now 9 milreis per 1000 cubic feet.

The resolution was then carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. F. W. BROTHERS, dividends were declared for the six months at the rates of 5 per cent., less income-tax, on the preference shares, and 4 per cent., tax free, on the ordinary shares—making, with the interim dividends already paid, 10 per cent. on the preference shares and 7 per cent. on the ordinary shares for the year.

Proposed by the CHAIRMAN, and seconded by Mr. WALLROTH, Mr. Thomas Guyatt was re-elected a Director; and on the motion of Mr. WEBB, seconded by Mr. T. FISHER, Mr. A. W. Cooper was elected Auditor for the ensuing year.

Mr. T. M'MAKING proposed a hearty vote of thanks to the Chairman and Directors; and Mr. LONG, in seconding, congratulated the Board on having been able to declare a higher dividend. This was carried.

The CHAIRMAN, in acknowledgment, expressed the hope that future accounts of the Company would be as satisfactory as those which had been submitted that day. Continuing, he proposed a vote of thanks to the Engineer and staff in Ceara, and the Secretary in London. He remarked that they were, of course, in the hands of the local staff with regard to the management and conduct of the works; and up to the present they had every reason to be satisfied. Mr. Herbert Gandon, their Engineer, attended most assiduously to the works; and his reports had been exceedingly satisfactory, both as regards the condition of the works and the future prospects of the Company. Of course, they were dependent somewhat on climatic influences in Ceara. A few years ago, the shareholders would remember, they were very hard pressed on account of the drought; and the Company had some difficulty in getting their money from the Government. At present, the rains had not been of the character which was usual; but the rainy season was not yet over, and he trusted therefore they would still see those rains on which both the prosperity of the Company and that of the Province depended.

The motion having been seconded and heartily agreed to, a brief acknowledgment of the vote was made by the SECRETARY, and this concluded the meeting.

COLONIAL GAS ASSOCIATION.

The Annual General Meeting of the Association was held last Tuesday, at the London Offices, Suffolk House, Laurence Pountney Hill, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. Alfred J. Kingdon) read the notice calling the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, said he thought the shareholders would fully agree with the Directors that the balance-sheet was the most satisfactory they had been able to present for some years. When addressing the shareholders last year, he was hopeful of a better return for this year than last; and the anticipation he was pleased to say was borne out in the result. He also said then it was the hope of the Board that a slightly increased dividend might be paid; and this it would be seen could have been done. It had, however, been considered by the Board that it would be more prudent to continue the 5 per cent. per annum—the same rate as last year—taking into consideration the extra price (about 1s. 6d. per ton more) at which they had had to make their coal contracts. Besides this they had decided to reduce the price of gas to the consumers in several of the towns in which the works were situated, as both the London and the Australian Board thought that, by lowering the price of gas, it would bring the Company an increased consumption. In such case they were hopeful that the profit would increase, while at the same time considerably benefiting the consumers by the reduction. The great prosperity in Australia, it was most gratifying to state, still continued; and on all sides one heard and read that all industries, banks, agriculture, and in fact everybody seemed to be doing well. All must trust most sincerely that this would long continue, and that nothing in the way of a serious drought would arise to upset the progress of the Colony. In May last, the Premier of Victoria, the Hon. Thomas Bent (who had been a member of the Australian Board from the inception of the Company), visited London; and during his stay he was good enough to spare time to attend a Board meeting, and give his London colleagues an account of most of the works of the Association—he having visited ten out of the twelve they owned. He assured the Board that, "from his personal knowledge of the towns, the Association had an excellent property, which was bound to progress, and that they would share in the benefits arising from the prosperity of the Colony." It would be noticed that the Managing Director reported that the works and mains were in good order. Turning to the balance-sheet, he might mention that the figures in the revenue account for the past year, in nearly every instance, showed favourable increases—the exceptions being for bad debts, which were more than double those for the previous year. But as they did not equal more than 1s. 6d. per cent., the shareholders would consider that they were marvellously low. The other item was merely some £30 less profit from fittings. It would be noticed that the Company had spent £1350 in extensions during the past year—part being necessary for a Manager's house, and the balance for mains, and both being charges well incurred in the best interests of the Company. They had again written off above £1000 for depreciation; and after recommending a dividend of 6 per cent. per annum (making with the interim dividend 5 per cent. for the year), this enabled the Directors to put to the reserve fund £826, making the amount £4500 (which was more than enough to pay a year's dividend) and leave £893 to be carried forward, against £768 last year. It was satisfactory to state that they had had nearly 9 per cent. increase in the consumption of gas during the past year; and it was most gratifying to report that from the returns already to hand for the current year, the sales had been considerably more. If this rate of progress continued he did not think he should be far out in saying that the Board would be in a position to meet the shareholders next year with much better results even than were exhibited by the present balance-sheet—satisfactory as that was. He was pleased to say that, during the past year, they had connected 205 new consumers, and that, in the past five years, the sales of gas and residuals showed an increase of 30 per cent.

Mr. CHARLES HUNT seconded the motion.

Mr. R. H. DYER inquired if all the coal used was Australian. [The CHAIRMAN: Yes.] Then, he added, that accounted for the small increase of 1s. 6d. per ton, instead of 3s. 6d. or thereabouts as in this country. It would also be interesting to know from which works the increase of consumption came. He should imagine it was from the larger ones, as he knew from experience they could not do anything much with works with an output of under 3 millions. The Chairman had also mentioned a reduction in the price of gas. He noticed that at some of the smaller works the price was high; and he hoped that reductions had been made there, so as to encourage an increased consumption. As to the payment of a higher dividend, he thought the policy of the Board in writing off for depreciation was a right one, and one that would benefit the concern more than a ½ per cent. increase in dividend would the shareholders.

The CHAIRMAN replied that they had only had out of their whole twelve works a falling off at one small station. All the others had increased; and the percentages of increase ranged from 3¼ to 18½. The Board were looking well after reductions in price at all the stations, in order to induce an increased consumption; and this was bound to tell its tale in time. Their latest returns showed that the progress was very satisfactory for this year. The figures began at 3⅛ per cent. and ran up to 44½ per cent.; so that their prospects were very hopeful.

The motion was unanimously carried.

The CHAIRMAN proposed the declaration of a dividend at the rate of 6 per cent. (making with the interim payment 5 per cent. for the year), and the adding of £826 8s. to the reserve fund. The Directors, he mentioned, could have paid more; but it was better to be a bit conservative on this occasion in view of the increased charges for coal.

Mr. W. C. PARKINSON, in seconding the motion, said he was glad to hear the approval of the shareholders to the action of the Directors in continuing the same dividend and in strengthening the position of the Company, which course would give them more favourable anticipations for the future.

The motion was agreed to.

On the motion of the CHAIRMAN, seconded by Mr. F. R. SMITH, Mr. A. Godwin-Hammack was re-elected to his seat at the Board.

The CHAIRMAN moved that the Hon. George Swinburne, the Managing-Director in Australia, be also re-elected to the Board. He remarked that Mr. Swinburne came up for re-election every three years. He was a good man for the Association to have in Australia, seeing that he was a member of Parliament and of the Cabinet.

Mr. HUNT, in seconding, agreed that the Association could not have a better Managing-Director. He would also like to take the opportunity of saying that he was also pleased indeed to hear the remarks of Mr. Dyer, regarding the conservative policy the Board were adopting. He was sure the strengthening of the reserves and the keeping down of the capital expenditure, as far as the Directors could consistently with increasing the business, was a great deal better than paying every penny in increased dividend. He was also certain the shareholders would be with the Board in the policy they were pursuing of reducing the price of gas as far as they prudently could. As had been observed, the price was high; and it appeared so especially to those accustomed to English prices. But they must pay some regard to the circumstances of the Colony; and they could never expect to supply gas there at the same price as at home. Consistently with the interests of the shareholders, the Directors were desirous of reducing the price as much as possible.

The motion was unanimously carried.

Mr. GODWIN-HAMMACK having made acknowledgment of the continued confidence of the shareholders,

On the proposition of Mr. DYER, seconded by Mr. F. G. PAINTER, the Auditors (Messrs. Wood, Drew, and Co.) were reappointed.

Votes of thanks were passed to the Chairman and Directors both in London and Australia, and to the Secretary and the works officials.

The proceedings then terminated.

A scheme of water supply for the town of Pietersburg, in the Transvaal, is in contemplation at the present time, and it is estimated to cost £23,860.

NEW GAS-WORKS FOR ABERAVON.

Opening Ceremony.

The new gas-works which have been erected by the Aberavon Corporation at a cost of about £14,000 were formally opened by the Mayor (Mr. J. M. Smith) on Monday last week, in the presence of a numerous company. The site, containing rather more than 2 acres, was purchased from Sir Arthur P. Vivian, K.C.B., for £1000; and a commencement was made by putting up a gasholder, which was supplied from the old works, and a house for the Manager (Mr. A. J. Bond). But the rapid advance of the district soon rendered the old manufacturing plant inadequate to the demand; and the new works were therefore proceeded with as rapidly as possible. They consist of a double-stage retort-house capable of containing 56 retorts in regenerator settings, and a coal-store equal to holding 300 tons of coal. The condensers are of the annular atmospheric type. Adjoining the retort-house is a block of buildings comprising a pump-house, with overhead tar, liquor, and water tanks; also an exhauster and engine house, a boiler-house, and a station meter and governor house. The tar and liquor are run into an underground concrete tank, capable of holding 90,000 gallons. The purifier-house contains six boxes, each 14 feet square. It has been decided to build a sulphate of ammonia house and plant, as well as suitable offices, workshops, and stores. The works, which are equal to the production of 100 million cubic feet of gas per annum, adjoin the Swansea and Rhondda Bay Railway, with which they are connected by a siding. They were designed by Messrs. Thomas Newbigging and Son, of Manchester; and they bear evidence of having been laid out with an eye to the economical delivery of coal and other materials into the works, and the removal of residuals therefrom, as well as with a view to their future extension, ample space having been left for the purpose. The consumption of gas is growing so rapidly, that already consideration is being given to the filling up of the vacant arches in the retort-house. The erection of the buildings and plant was supervised by Mr. Bond, as Clerk of Works.

On the assembling of the company, the Mayor, divested of his coat and armed with a large stoking-shovel, proceeded to charge one of the retorts amid applause. Mr. William Newbigging, on behalf of the Engineers, then presented the Mayor with an engraved silver cigar-case, as a memento of the occasion, and acknowledged his unfailing courtesy, and the attention which, as Chairman of the Gas Committee, he always gave to matters connected with the gas undertaking. The Mayor expressed his thanks for the handsome souvenir of the important occasion of the opening of the new gas-works of which he had just been the recipient. He felt constrained to say that never had an undertaking been completed with greater harmony, and to the more entire satisfaction of all concerned. The performance of his little duty as stoker recalled to him the fact that it was not the first time he had discharged that duty, as he remembered when he, as one of the members of the Council, had to go down to the old gas-works and charge the retorts so as to keep the works going. He felt particularly pleased that the duty that day had fallen to his lot, as his father was one of the promoters of the old gas-works when they were in the hands of a private Company; and it was his father who had charged the retort on the opening of them. It was a pleasing coincidence, therefore, that the duty had fallen to his lot on this occasion. He sincerely hoped that success and prosperity would attend their new enterprise, that it would give entire satisfaction to all the members of the Corporation, and would prove a blessing to the ratepayers as a financial asset which would go to greatly relieve the rates. He thanked Messrs. Newbigging and the Contractors (Barnes, Chaplin, and Co. for the buildings, Clapham Bros. for the ironwork and fittings, Parkinson and W. & B. Cowan for the meters and governors, and the Bryan Donkin Company for the engine and exhauster) for the excellent manner in which they had carried out their respective contracts.

The company were then conducted round the works and the various new features and improvements explained to them. Subsequently they were invited by the Mayor and the Contractors to join them at luncheon at the Vivian Hotel. The Mayor presided, and proposed "Success to the New Gas-Works and to the Contractors," which was cordially honoured. He next asked the company to drink to the health of the Gas Manager. He said Mr. Bond had had a very troublesome time to pass through, and he had proved himself a very able and efficient Manager. During those periods of anxiety, he had looked forward to having the new works; and he (the speaker) was glad he had seen them completed. He hoped he would be spared to continue the deep interest he had taken in the gas problem of the town, and make the present enterprise a credit to himself and a source of pleasure and financial benefit to the inhabitants. Mr. Newbigging, in acknowledging the first toast, said his firm, as Engineers, appreciated deeply the kindness shown them since they commenced their work. He added that he thought the Council were most fortunate in getting Messrs. Barnes, Chaplin, and Co. to carry out the contract. They performed their duty admirably, and the work was certainly a credit to South Wales. Messrs. Clapham Bros. had also done their work well. One point he should like to emphasize was that he thought Mr. Bond's abilities should be more fully recognized by the Council, or they might lose him by tempting offers from others. Mr. Chaplin also responded. He said it was a great pleasure to him to hear the kind sentiments expressed on the occasion of the opening of the works; and when there was a general feeling of satisfaction, it augured well for the undertaking. He had no hesitation in saying that Aberavon, with their new works, had a good, sound, strong, commercial establishment, which, under the guidance of so able a Manager as Mr. Bond, would be certain to prove a great boon to the district, financially and otherwise. Mr. Bond expressed his thanks for the kindly reference which had been made to him. He said he had for some time looked forward to the opening of the new works, and he felt convinced that the capital expended would be recouped, and that the ratepayers would materially benefit through this spirit of progress. For their size, the Aberavon works were among the most-up-to-date in South Wales; and from an engineering point of view they were well-designed and carried out. The Contractors and Messrs. Clapham Bros. had carried out their contracts to the letter, and the masonry work had been excellently done. With regard to Mr. Newbigging, the firm with which he was connected held one of the first positions in the country as gas engineers. The toast of "The Mayor" was then honoured and responded to, and the function ended.

SIR GEORGE LIVESEY ON THE RAILWAY DISPUTE.

The following letter by Sir George Livesey, dealing with the present dispute between the railway men and the Companies, appeared in "The Times" on Saturday.

Hitherto, though strongly tempted, I have refrained generally from expressing an opinion on the railway question, mainly because the Railway Companies know their own business, realize their responsibility, and are, as it appears to me, absolutely right in refusing official recognition to any Trade Union. There is, however, a strong impression in a considerable section of the public, who mean well, that they (the Companies) are wrong. But, unfortunately, these well-meaning people, whose feelings have been excited by certain newspapers —"The Times" and some others excepted—have no real knowledge or experience of the meaning of recognition. It seems so simple, and is said to be the "natural method adopted in all our larger industries" and is a "liberty enjoyed as a matter of course by every industry of equal importance." Is there another industry of equal importance to the railways? But, letting that pass, it is not the fact that recognition exists in all our larger industries, of which the gas industry, which does not recognize the Gas Workers' Union, may claim to be one. Moreover, the supply of gas without any interruption is a public necessity, and in that respect is a parallel case to that of the railways. In both a lock-out is inconceivable, impossible; and a strike ought to be equally so, on the all-sufficient ground of the public interest and safety. There are one or two other industries, such as the supply of water, to which the same absolute rule of "no stoppage whatever" applies. The Post Office is another where a limited recognition has been granted; but sufficient time has not passed to bring out its defects or to prove its failure. But let the Postmen's Union mention the word "strike;" what would happen to their recognition? Neither a lock-out nor a strike is possible in the Post Office, whether the Union is recognized or not. In the case of the public companies referred to, however, whenever a Trade Union attains sufficient strength, the strike weapon, concealed though it sometimes may be, is always there as the ultimate resort if the demands of the Union are not conceded. In the case of the Railway Union there is no concealment. It is simply: Concede our demand for recognition or we strike. Grant this demand, which will certainly be followed by others, and others again, and who ventures to say that if those demands are not conceded the strike weapon, first as a threat and ultimately in reality, will not be used? The fact that this Union has dared to threaten the public with a strike should put it out of Court, and is an all-sufficient reason and justification for the refusal of recognition by the Railway Companies.

"The Times" articles on the subject have been admirable. But the pithiest and most forcible, and withal true, remark I have seen was an extract from the "Tatler:" "The Railway Companies have resolved to fight in their first ditch instead of their last." They will certainly have to fight this Union—the sooner the better; and it is to be hoped the public, in their own interest, will not interfere, for any interference must be mischievous.

In 1889, the gas industry recognized the Gas Workers' Union, negotiated with them, made concessions so liberal and so readily that the only effect was to ask for more; the result, serious strikes at Bristol (a Company), Manchester, Salford, Leeds, and Darwen (Corporations), and London and other places (Companies). Recognition deprived us of all authority. The most simple orders to the men were referred to the Union as to whether they were to be obeyed or not; and the men were ordered by the Union not to do certain work they had hitherto performed, on the ground that it was not stokers' work on the Trade Union principle of "one man one job." It was simply intolerable, with the threat of a strike, like the sword of Damocles, always over our heads.

It will be said that this was a thing of the past—that the Unions are wiser and more reasonable now. Are they? What about the Trade Disputes Act of last year, and the interpretation thereof at Belfast by the Trade Unions, and, I am sorry to say, also by the Government, as was shown in the newspaper accounts and confirmed by authoritative information given to me? It will also be said that Mr. Bell is a fair-minded and reasonable man. As to fairness, I have nothing to say; but I must refer to the article by a Railway Official in "The Times" of Oct. 30. But I willingly give him credit for his stand against Socialism, and will assume that probably he would be reasonable if those behind him would let him, which is extremely doubtful. Quite lately he had to fight for his life as Secretary, as, in fact, he is doing now; and from a remark lately made by himself, referring to the probability that he would not be re-elected as M.P. because he would not join the Independent Labour Party, his tenure of the secretaryship seems very insecure. His successor will, no doubt, be a Socialist, and then where would the reasonableness be in negotiating with the railways?

In short, Sir, in one word, this is a question of mastery. As one of our stokers, a member of the Gas Workers' Union, said before the strike, "Trade Unions are all very well, but this —— Union wants to be master of everybody." Shall the control of the railways remain in the hands of the owners, who have, with the authority of Parliament, appointed the responsible managers, or shall it pass to the irresponsible Trade Union. This is really—disguise it as certain men may—what recognition of the Union means; and it also means, sooner or later, a determined struggle for mastery. In all the great industries referred to, these struggles, in the form of serious and prolonged strikes or lock-outs, have taken place, which mattered to none but themselves. The last great fight was the six months' strike and lock-out of the engineers in 1897. The question of mastery was settled by the defeat of the Union, and now for that reason there is peace. But it is an armed peace, which can only be maintained by constant watchfulness and readiness for war. The railway service of the country must not be subject to the possi-

bility of a strike. The aggressors are the A.S.R.S., and any interference with, or any weakening of the hands of, the Railway Companies will, I believe, be a very serious mistake—detrimental to the public interest, which in this matter is paramount.

I have more to say, but feel that this is not the time, and will therefore only remark that recognition of the right sort and of the right men is necessary. The Railway Companies rightly see that the only men to be recognized are their own; therefore the question is only one of method. Of course, I advocate co-partnership, with its Workmen's Committee and Workmen Directors, whereby the recognition is full and complete and works most satisfactorily. Several Chairmen and General Managers have been in communication with me on the subject, and were evidently sympathetic. I have no authority to speak on their behalf, and no desire to do so; but I have an impression that there is the fear that the giving of a co-partnership bonus of the smallest amount that would be effective with the men would adversely affect the dividend on the ordinary stock, which has to bear all such burdens. It is our experience that the bonus is fully earned by the better working of the employees. But at the starting of the system this can hardly be expected. A moderate percentage as a bonus on all salaries and wages would probably amount, if no part of it was earned, to $\frac{1}{4}$ or $\frac{3}{8}$ per cent. on the ordinary stock; and this might reduce the dividend, and be objected to by the shareholders. This is at least doubtful if the system so attached their men to them that strikes or threats of strikes became with them, as with us, impossible.

TEIGNMOUTH WATER-WORKS.

Cast-Iron v. Steel Pipes.

At a recent District Meeting of the Association of Municipal and County Engineers, held at Teignmouth, an interesting paper on "The Municipal Works of Teignmouth" was contributed by Mr. C. F. Gettings, the Borough Surveyor. In the course of it, he gave the following particulars in regard to the water supply.

The water supply was obtained from three sources—viz., a deep well and borehole situate at Mylon, and the Venn and Haldon streams. For distribution purposes, the town was divided into two zones. The high-level reservoir was situate on Haldon Hill, the top-water level being 424 5 feet about Ordnance datum; and the total capacity was 1,600,000 gallons. The low-level reservoir was situate at Landscore. This was covered, and its capacity was 300,000 gallons. It was supplied by the Venn stream and the Mylor well and borehole. In consequence of the insufficiency of the supply from existing sources, and the liability to occasional contamination, the Council had considered for a number of years the question of augmenting the supply, and had had many schemes before them. On his appointment, some three years ago, an agreement had just been entered into with the Paignton Urban District Council to take a supply in bulk from their Holne Moor reservoir; and one of his first instructions was to submit a scheme for a line of route connecting with the Paignton main. With the exception of the approaches to the river, the whole line of route was along the public highway; but, notwithstanding this, the cost of easements had been a serious item.

The main as laid in each case gravitated direct to the existing service reservoirs; the length between Park Hill and the Haseldown reservoir (about 10½ miles) being 9 inches diameter, with a duplicate across the River Teign. The supply for Shaldon branched off this main at Netherton, where there was a length of about three miles of 4-inch main to the Shaldon reservoir. At the Park Hill intake, a meter-house was provided, and 9-inch Venturi meters with recorders complete in duplicate would be provided. Meters would also be fixed on each supply main. The gradients and pressures were exceedingly heavy; the heaviest being on the section across the River Teign, where it amounted to 380 lbs. per square inch. After calculating the various thicknesses required for cast-iron pipes, and finding them so heavy, and considering their liability to fracture, the author decided to consider steel as an alternative. He took up the matter with the British Mannesmann Tube Company. He instituted inquiries on the Continent, and carried out exhaustive tests at the Company's works; and after making careful calculations, he came to the conclusion that he could safely recommend his Council to adopt the tubes, and effect a considerable saving on the initial cost of the scheme.

In the course of the discussion on the paper, Mr. S. Hutton (Exmouth) questioned the economy of steel tubes. He said he was commencing to lay 1¾ miles of 9-inch and 10-inch tubes, and the tender for them was £1691, whereas the price laid complete for cast-iron pipes was £1786. Of course, he had everything in his favour at Exmouth, as the farthest point was only 1½ miles from the railway station. It seemed to him that steel tubes might be proper things to use in an outlandish place where the carting was very costly; but that where the work was executed near a railway station cast-iron pipes were still the cheapest.

Mr. Gettings, replying to these remarks, pointed out that steel tubes were comparatively new things in this country, and they had been criticized pretty freely. Of course, so far as cost was concerned, it depended on several things—one being the pressure they had to deal with. Their pressures at Teignmouth were exceedingly high; being 380 lbs. to the square inch on the river. They all knew that it required a very heavy section of cast-iron pipe to withstand this pressure. When he told them that if he had used cast-iron pipes a large proportion of them would have had to be ⅞ inch and 1 inch in thickness, they could see that the cost would have been very heavy. With regard to the joints, there was a point not mentioned in the paper. He was using the lead-wool joint, and had tested the 9-inch pipe with a 3-inch socket up to 1000 lbs. It was a stipulation of the Local Government Board that they should not tap the main. Where connections had to be made, they had a pipe with a thickened shell from about 2 inches wide, which was equal to the thickness of cast iron; and this got over the Board's objection.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners held their monthly meeting on Monday, and had before them, among other things, Mr. Herring's report upon the Commissioners trading with the public (given in last week's "JOURNAL"), which was adopted without remark. Approval was given to a minute of the Works Committee, which stated that the Engineer had reported upon the diversions of gas-mains which would be rendered necessary by the laying of tramway lines in Gilmore Place and Broughton Street; the cost of the latter being expected to amount to more than £3000. This is defrayed by the Town Council, who are the owners of the tramways, and at whose instance the diversions are required. The Commissioners have entered upon a scheme for the extension of the head offices in Waterloo Place. When the Commissioners sell their New Street property, the Engineer's office will be displaced; and it will be necessary to find accommodation for that department elsewhere. The Commissioners have been fortunate in being able to secure a large tenement behind the Waterloo Place office. This will be taken into the general office, but first of all it will be necessary to reconstruct the building. Plans for the reconstruction have been prepared by the Engineer. These were approved, and instructions given to have the work of reconstruction gone on with. Bailie M'Kelvie asked if there was any intention on the part of the Commissioners in the near future to erect workmen's dwellings at Granton. After some discussion, on the suggestion of the Lord Provost, it was remitted to the Engineer to ascertain the views of the workmen on the subject. This being the last meeting of the Commission as at present constituted, the Lord Provost said it was customary to accord to the retiring Commissioners thanks for their services during their term of office. Five Commissioners retired at this time. Four of them might return to the Board; but, unfortunately, Mr. Menzies would not. They were sorry to part with him. They knew of the great services he had rendered, as Convener of the Finance and Law Committee; and they were indebted to him for all he had done for the Commission. Mr. Menzies returned thanks.

Something like a sensation has been occasioned in Dundee by a robbery which has taken place at the Corporation Gas Office—about £50 in silver having been stolen. On the afternoon of Saturday last, when the office was closed, the cash-box was locked in the strong room. On Monday morning it was discovered that the cash-box had been taken away. The chief clerk arrived first, and, in accordance with practice, he opened the door of the strong room. Shortly afterwards a junior employee went to fetch the cash-box, but found it was gone. Examination disclosed that neither on the locks of the strong room nor of the compartment were there any marks in the least indicative that force had been used; and the other fastenings of the premises were found to be intact. The robbery was reported to the police, who are engaged in elucidating the mystery of the occurrence.

The annual meeting of ratepayers in Old Meldrum was held on Monday evening. It was presided over by Provost Shand, who, in the course of his address upon public affairs, said that they had now the plant at the gas-works in first-class order, and that when once the old gasholder was replated, the works, for their size, would be almost second to none in the kingdom. He regretted that they had not been able to reduce the price of gas; but this was owing to the consumption not being larger. He appealed to the community to make more use of gas, and thus enable the Council to reduce the price.

Sometimes interesting information is obtained in the speeches of municipal candidates. Thus Bailie Bogle, of Falkirk, who was for a year or two Convener of the Gas Committee in that burgh, speaking at a meeting of electors on Tuesday evening, said "he had nothing whatever to do originally with the construction of the gas-works, as he had been opposed to the Thornhill scheme. He denied, however, that there had been any extravagance at the works, and said that the opinion of leading experts who had seen them was that if they had erred at all they had erred on the side of economy. The works had cost about £60,000. In April, 1896, the Town Council agreed to purchase a gasholder. It cost £7222, not including a concrete foundation or any other contiguous work. This holder was half the size of the one which they recently erected, and which, including foundations and everything, had cost £10,000. No one knew what was spent on the concrete which was lost at Parkhouse; but he knew what they spent for the ground. He knew that they bought the gasholder and had nowhere to put it. They had scheduled the ground, but had not bought it. The Council paid sweetly for the Parkhouse site. Including the gasholder, it cost about £15,000. When the holder was erected, it was found that there was no method whereby they could connect pipes between it and the old gas-works, which were to supply the holder with gas. The Council had to apply to the Caledonian Railway Company for permission to lay a pipe along the bank of the Canal to the works. The gasholder had not long been erected at Parkhouse when it leaned over like the Tower of Pisa. They tried to get it on to the perpendicular, which was a difficult job. The whole affair acted as a nightmare upon those who administered the Gas Department, because out of the £15,000 expended at Parkhouse they had only the plates of the gasholder as an asset when they removed it to Thornhill. They had tried, but tried in vain, to dispose of that salubrious spot known as Parkhouse."

The Elgin Town Council on Monday received the report of the Gas Committee, intimating to them the decision of Sheriff Wilson upon the question of the site of the proposed new gasholder at North Lodge. A report of the decision was given in the "JOURNAL" for the 8th ult. The Gas Committee recommended that the ground required be acquired from the Public Health Department, at the price of £300, and that the Burgh Surveyor be instructed to excavate a test pit, to ascertain the nature of the subsoil, and at the same time to report to what depth a drain could be taken from the pit to the North Street sewer. Mr. A. C. Junner asked if they should not now consider the question of reducing the height of the gasholder, and instead of telescoping it, to extend the diameter. He thought if they made the holder 40 feet instead of 60 feet high, and extended the diameter from 80 to 100 feet,

they would also increase their storage capacity. As they had been recommended by the Sheriff to sink it 15 feet, he thought they should get the two estimates. There might be a little more expenditure, but they would meet the Sheriff's recommendation. Provost Christie said that a one-lift holder of 100 feet diameter would hold 150,000 cubic feet; whereas the one they proposed to erect would hold 200,000 cubic feet. There was no reason why they should not get the two estimates. Bailie Gordon, the Convener of the Gas Committee, said the only difficulty was that it would make it necessary for them to go over the plans and specifications again, which had been already sanctioned by the Council—to the extent, indeed, that they were in a position to take in offers. He could not understand why they should go back upon what had been already decided. The Gas Manager—Mr. J. Kay—in reply to Provost Christie, said it would be possible to erect a wider holder, but he could not say whether they could put in a 100 feet one. It would cost a great deal more money—£35 per 1000 cubic feet, as against £20. The Council, however, eventually agreed that estimates should be obtained as suggested by Mr. Junner. The Town Clerk submitted a letter which he had received from the employees at the gas-works, asking for an increase of wages of 1d. per hour. The application was sent to the Gas Committee for consideration.

In the beginning of December of last year, the Corporation of Sanquhar acquired the gas-works in the town, which were the property of Messrs. Ballantyne, Howat, and Son. The undertaking was a small one, with a capital of £1400. The price to be paid by the Town Council was £850. After the transfer had been agreed to, it was found that an irregularity had been committed, in respect that the Town Council had not first adopted the Gas Acts. To get over this difficulty, the Council arranged that Messrs. Forsyth and M'Crae, solicitors, should become the purchasers, and carry on the undertaking till after the election now pending; the Council agreeing to make good to them any loss which they might sustain during the year. This arrangement brings the subject of the gas transfer up for decision now. As a consequence, more than usual interest is being taken in the municipal election which is pending. There was a meeting of the ratepayers of the burgh on Monday evening, which crowded the Council House. Provost Waugh said that the gas undertaking came into the market, and the Council wished to take it over. Two years ago they got a mandate from the ratepayers to do this. The Council had published what they were doing, and intended to do, in the newspapers—and also by a leaflet which was sent to every individual ratepayer. When the Council heard that Mr. Howat meant to dispose of the gas-works, they set about making inquiries. They got reports from New Cumnock, Lochmaben, Thornhill, Lesmahagow, and other places, as to their experiences; and they made themselves certain that the thing would be a success. Very little had been spent on the gas-works, and a little would require to be spent; but they had made themselves certain that if this were done they would be able to give better gas, an adequate supply, and a cheaper rate than had been obtained by the inhabitants of Sanquhar for many years. Bailie Tweddel said he was the first to approach Mr. Howat on the subject of the gas-works, having heard he was ready to sell. He named his price; and it was brought before the Council. Mr. Howat told them they must take it then; they must decide one way or the other, because he had another purchaser. There was a good deal of opposition to the proposed transfer. After some discussion, it was agreed that a *plébiscite* of the electors be taken upon the subject; and it is understood that, before the electors are called upon to state whether they approve of the transfer or not, they will be furnished with a statement as to the position of the undertaking.

The annual meeting of the ratepayers of Lockerbie was held at the end of last week. At it Councillor Gordon said that when he first became connected with the gas-works, seven years ago, he found that they suffered from two very serious defects. In the first place, they were short of storage and the pipes were leaking. In the second place, the producing plant was old and worn out, and incapable of yielding the best value from the coal used. It was a serious question with the Gas Committee which of these defects should be remedied first. After much consideration, they decided to improve the storage capacity and overtake the leakage. The result had justified their action, as the leakage overtaken had paid for the cost of the alterations, and enabled them to take 1d. off the contingent rate as well. They had now completed the reconstruction of the producing plant; and the result had been already seen to be equally satisfactory. The Gas Committee had been hopeful that they would have been able to reduce the price of gas this year to ordinary consumers; but the rise in the cost of coal had made that impossible, though they had succeeded in reducing it for cooking by 10d. per 1000 cubic feet.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, *Nov.* 2.

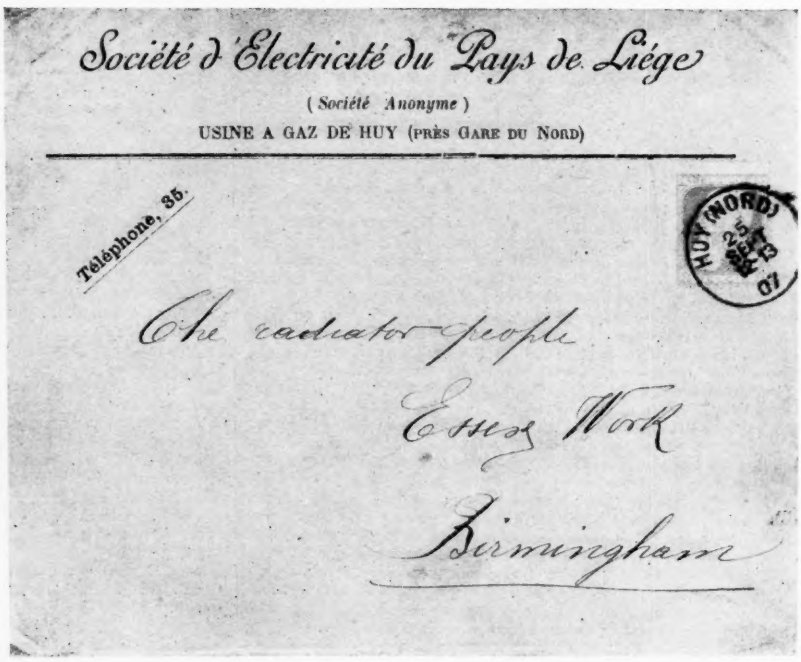
There has been no change in the situation during the week. Current production has been absorbed as it has become available without material alteration in values, and spot prices have been paid for November delivery. The closing quotations are £11 18s. 9d. per ton f.o.b. Hull, £12 3s. 9d. to £12 5s. per ton f.o.b. Liverpool, and £12 5s. per ton f.o.b. Leith, where supplies continue to be scarce. In the forward position, Scotch makers are now quoting £12 10s. per ton f.o.b. Leith for spring months, but nothing over £12 7s. 6d. per ton has been reported paid. At other points, there are sellers at £12 7s. 6d. per ton f.o.b. for January-April delivery.

Nitrate of Soda.

This article is rather easier at 11s. per cwt. for 95 per cent. and 11s. 3d. for refined quality, on spot.

THIS ENVELOPE SHOWS HOW WRIGHTS ARE RECOGNIZED BOTH AT HOME AND ABROAD AS

THE RADIATOR PEOPLE.



LONDON, *Nov.* 4.

Tar Products.

The markets remain in about the same position, and there is not much business to report. Pitch is almost unsaleable for prompt. The price for this year's delivery may be taken as 24s. 6d. to 24s. 9d.; east coast prices may be taken as 23s. 3d. to 24s.; while on the west coast, the price is again lower at 22s. 6d. to 23s. 6d. Creosote is rather dull at present, and prices are slightly lower for prompt delvery—a parcel of London make having been sold at 2⅜d. In the Midlands, 3d. is considered the figure; but in the North, business has been done at 2 11/16d. Benzol and toluol remain very quiet; the demand being limited. This also applies to solvent naphtha; while the demand for heavy naphtha continues good. There is nothing fresh to report in carbolic. Anthracene remains dull.

The average values during the week were: Tar, 14s. 9d. to 18s. 9d., *ex* works. Pitch, London, 24s. 6d. to 24s. 9d.; east coast, 23s. 3d. to 23s. 9d.; west coast, 22s. 6d. to 23s. 6d. Benzol, 90 per cent., 8½d. to 9d., casks included; 50-90 per cent., 8½d. to 9d., casks included. Toluol, 10d. to 10¼d., casks included. Crude naphtha, 3⅜d. to 4d., naked; solvent naphtha, 11d. to 1s. 1d., casks included; heavy naphtha, 1s. to 1s. 2d., casks included. Creosote, London, 2⅜d. to 2⅝d. naked; North, 2 1/16d. to 2⅜d. naked. Heavy oils, 3⅛d. to 3¼d. naked. Carbolic acid, 60 per cent., 1s. 8d. to 1s. 8½d., casks included. Naphthalene, £6 10s. to £10 10s., packages included; salts, 37s. 6d. to 42s. 6d., packages included. Anthracene, "A" quality, 1½d. to 1⅝d., casks included.

Sulphate of Ammonia.

There is a very good demand, and the market continues firm. London makers ask £12 7s. 6d. to £12 10s.; outside makes are selling at £12 to £12 2s. 6d. on Beckton terms. In Hull, £12 2s. 6d. may be taken as the price for prompt delivery. In Liverpool, £12 2s. 6d., and in Leith £12 5s. to £12 7s. 6d. are about the ruling figures.

COAL TRADE REPORTS.

Lancashire Coal Trade.

There is no change of importance to note in the general conditions of the coal trade of the county. The outlook is on the side of coal-owners; for many new cotton mills and weaving sheds are still being erected, and no substitute for coal has yet been invented. The operative miners have been eagerly awaiting the decision of Lord James of Hereford as to whether their application for the final increase of 5 per cent. in wages is to be given. The result was expected to be announced last Friday; but his Lordship has adjourned the question for another three weeks. The masters state that coal is no dearer now than two months ago, and that they do not feel themselves justified in granting the rise at present. Lord James is probably waiting to see the result of the railway crisis before making known his decision. There are rumours of colliery combines in the country, which may come to fruition; and if so, it is easy to see what power such combinations could wield.

Northern Coal Trade.

In the northern coal trade, the demand has shown some improvement; and the prices have in some cases grown firmer. Best Northumberland steams are about 15s per ton f.o.b., second-class steams from 14s. to 14s. 6d., and steam smalls are 10s. 3d. to about 10s. 9d. The collieries are now working well, generally, and the output seems to be well taken up, as some users appear disposed to lay in stocks. In the gas coal trade, the demand is heavier, and there are now deliveries that are nearly at the maximum rate of the year; so that the large consumers are beginning to prepare for the period of fullest consumption. Durham gas coals are quoted from about 13s. 6d. to 15s. per ton f.o.b., with a higher price for one or two special qualities. There are no important contracts now in treaty. Some sales, however, have been arranged for export over next year, at prices that show considerable variations, and which on the whole seem to justify the belief that, after the winter demand has been met, prices may be easier, though, at the same time, the advances in the wages of the miners, both given and expected to be given, must influence future values. In the coke trade, prices are easier; but gas coke is still quoted from 19s. to 20s. per ton f.o.b.

Scotch Coal Trade.

Trade has become quieter, as the result of lessening demands from abroad and the growing feeling that the railway trouble will be got over without a cessation of work. Old contracts continue to make the collieries busy; but it is reported that very little new business is being placed. Forward buying is not in favour, either with buyers or sellers—the latter being somewhat afraid to venture upon long-standing contracts in the meantime, in view of the request of the miners for a further advance of wages. The home demand for industrial purposes has not slackened. The prices quoted are: Ell 14s. 6d. to 16s. 6d. per ton f.o.b. Glasgow, splint 15s. to 15s. 6d., and steam 14s. to 14s. 3d. The shipments for the week amounted to 288,262 tons—a decrease of 8145 tons upon the preceding week, and of 3073 tons upon the same week of last year. For the year to date, the total shipments have been 12,182,794 tons—an increase upon the corresponding period of 772,266 tons.

Medals for Manchester Gas Workers.—We are glad to learn that the Royal Humane Society have awarded bronze medals to J. H. Bell and W. Surrey, for the great, but unhappily unsuccessful, efforts they made to save a companion named Prior, who was overcome while testing one of the gas-syphons at the Bradford Road Gas-Works of the Manchester Corporation. A report of the accident appeared in the "JOURNAL" for July 30 (p. 342), when a tribute was paid to the bravery displayed by the two men whose action has now been so fittingly recognized.

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More New Issues of Gas and Water Capital.

In the last number of the "JOURNAL" attention was called to new issues of capital by the Sutton and Croydon Gas Companies. From announcements appearing in another part of to-day's issue, it will be seen that some further issues, consisting of both gas and water capital, are about to be made. Next Tuesday, Mr. Alfred Richards will carry out instructions received from the Directors of the Worthing Gas Company to offer 400 ordinary £10 shares, ranking for a standard dividend of 7 per cent. per annum, subject to the sliding-scale; the dividends on existing similar shares in the Company having for many years past been paid at this rate. On the same occasion, he will invite biddings for a new issue of £4000 of 4 per cent. debenture bonds, which he has been instructed by the Directors of the Romford Gas Company to sell. The interest (less income-tax) will be payable on March 31 and Sept. 30; and it will accrue from the 1st prox. Another new issue is £3000 of additional "B" stock by order of the Directors of the Horley District Gas Company. This stock ranks for a standard dividend of 7 per cent., subject to the sliding-scale; the dividends on the Company's existing similar stock having for the last four half years been at the rate of £5 12s. per cent. per annum.

Barry District Council and their Gas Engineer.

Among the matters considered by the Barry Gas and Water Committee at a meeting last week, was a letter from a Solicitor, on behalf of the Gas Engineer, Mr. F. M. Harris, making a claim for £643, being 2¼ per cent. commission on new works carried out under the Council. An answer was requested before Nov. 7, as otherwise the claim would be statute barred; and as Mr. Harris intended to enforce the claim by legal process, he could not do so unless in the meantime the Council consented to accept the account and waive any such objection. Mr. Harris, it will be remembered, was recently given notice to terminate his engagement with the Council, in order to permit of a re-arrangement of the official control of both the gas and water undertakings. Mr. Lee asked if Mr. Harris had ever made any application for this money, and the Clerk replied that, so far as he was concerned, it had not been made; but it had been brought on before on Dec. 12, 1894. The Chairman (Mr. S. R. Jones) said they should be in the first place furnished with details; and the Council should also have particulars of the agreement entered into by the Barry Gas and Water Company, who formerly owned the works, and had engaged Mr. Harris. At the request of Mr. Watson, a letter received from another firm was read, to the effect that at the time Mr. Harris was engaged by the Company he was induced to give up an important appointment at Falmouth, and had practically suggested his own terms of appointment. It was decided to ask for the agreement and details of the account.

A Disputed Gas Account.

Judge Gwynne James and a Jury were occupied for several hours at the Chippenham County Court, on Oct. 22, in hearing an action remitted from the High Court, in which the Chippenham Gas Company sued Richard Careless, proprietor of the Angel Hotel, Chippenham, to recover the sum of £51 0s. 9d. for gas supplied. Mr. J. A. Foote, K.C. (with whom was Mr. Rayner Goddard), appeared for the plaintiffs; and Mr. Wakeley was Counsel for the defendant. The account referred to gas supplied during the two quarters ended December, 1906, and March, 1907. The defence was that the gas charged for had not been consumed, and that air and gas of bad illuminating power had been passed through the meter. There were six other cases against tradesmen in the town; and it was agreed at the outset that that of Mr. Careless should be taken as a test action. A number of witnesses were in attendance; the Court being crowded during the hearing. It was sought to show that during the period to which the action had reference the gas, both in the streets and in public and private buildings in the town, was of an inferior quality; and that on one occasion the supply collapsed altogether. The Judge, in putting the case to the Jury, pointed out that the pressure and illuminating power were questions with which they had nothing to do, as if it could be shown that the gas had passed through the meter—and there had been no evidence to the contrary—the defendant was liable. The Jury returned a verdict for the plaintiffs for the amount claimed; and judgment was entered accordingly, with costs.

The Christmas-Box Question.

A largely-attended meeting of representative London retail traders, who previous to last year made substantial profits annually by supplying the goods for Christmas presents, was held at the Cannon Street Hotel last Friday, under the presidency of Colonel Griffith. It was pointed out that the erroneous interpretation of the Prevention of Corruption Act by the public had caused a decrease, amounting to many thousands of pounds, in Christmas trade. The following resolution was carried: "That this meeting approves of a combination of traders being formed for the purpose of extensively advertising the true meaning of the Prevention of Corruption Act, and authorizes a fund to be instituted for carrying out the scheme." A Committee was appointed to consider the best means of giving effect to the proposal. Referring to the meeting, the "Pall Mall Gazette" on the same day made the following remarks, which express fairly well our own views on the matter: "The very slightest knowledge of commercial circles teaches that in the past there has been concealed beneath the innocent surface of seasonable generosity a vicious system of bribery on the one hand and blackmail on the other, under which the employees of many firms were practically serving two masters, while other traders found it hard to secure a fair chance in business without submitting to illicit exactions. It should not be at all difficult for honest people to discriminate between what is permissible under the new Act and what comes under the extended sphere of criminal penalties. The hall-mark of corruption is secrecy; and any servant who feels it impossible to inform his employers of the Christmas-box sent him by an outsider, is both compromising with his conscience and accepting the risks of prosecution."

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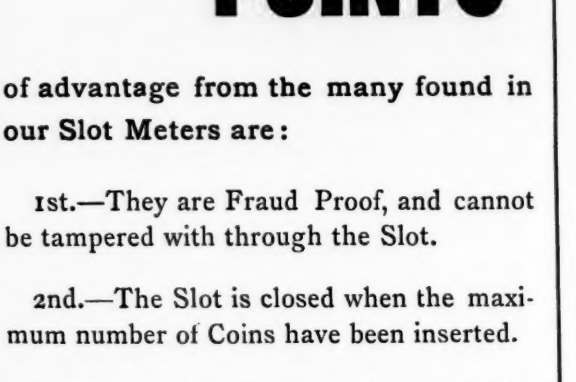

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AGENTS FOR SCOTLAND:

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The Manchester Gas Committee and Coalite.—The Gas Engineer to the Manchester Corporation (Mr. J. G. Newbigging, M.Inst.C.E.) has reported that it is impracticable to place any of the land belonging to the Corporation within the area of the Bradford Road works at the disposal of the British Coalite Company, Limited, as the Company suggest, for the erection of a producer plant. The Committee have confirmed this by resolution.

Tradesmen and Municipal Competition at Stockport.—The Stockport Tradesmen's Association have addressed a letter to the respective candidates for seats in the Town Council asking if, on election, they would use their votes and influence against municipal trading being extended so as to injuriously affect the tradesmen of the town, many of whom have publicly, through the Association, often recorded their strong objection to the capital which they as large ratepayers help to build up through the rates being used to bring about very unfair competition with private traders.

A Reply to a Circular of Inquiry at Barry.—The Barry Gas and Water Committee have been trying their hands at the "Circular of Inquiry" business; having communicated with managers in various parts of the country with regard to the methods employed for testing gas coal. One of the replies, which a local paper says was "from Bristol," with the report of its reception, is worth reproducing. It was as follows: "Dear Sir,—The modesty of your letter and circular is charming. (Laughter.) We have a coal-testing plant; and its name indicates what it consists of. (Renewed laughter.) Before replying to your questions, I should be glad to know if you have any similar ones to ask." The Chairman (Mr. S. R. Jones): It would be well to organize an entertainment, and get that man down. (Laughter.)

Birmingham Employees' Superannuation Fund.—The Finance Committee have prepared a report on the working of the superannuation scheme for presentation to the Birmingham City Council. When the scheme came into force in April, 1898, it was expected that a contribution of 3 per cent. from employees would eventually suffice to pay so much of the superannuation allowances granted under the scheme as would leave a similar amount to be paid by the Corporation. They have had the working investigated by Mr. T. G. Auckland; and it is found that these percentages will not be sufficient to pay the benefits to be granted under the scheme. The Committee therefore recommend that they be instructed to bring up an amending scheme; but any alteration that may be made will not prejudice the rights of present contributories to the existing scheme.

Sales of Shares.—At the Mart, Tokenhouse Yard, E.C., on Tuesday last, Mr. Alfred Richards offered for sale £13,500 of new ordinary "B" stock of the Southend Gas Company, ranking for a standard dividend of 5 per cent., subject to the sliding-scale, but carrying £5 7s. 6d. per cent. as from the 1st prox. The stock was all disposed of at prices ranging from £105 to £108 per £100; and some perpetual 4 per cent. debenture stock of the Company at £100 to £101. An issue of £5000 of new ordinary 7 per cent. stocks of the Great Yarmouth Water Company, under their Act of 1899, was sold, by the Directors' instructions; the prices realized being £93 10s. to £100 per £100 of stock, *cum div.* at the rate of 4 per cent. per annum as from the 25th inst. Some £5 "B" shares in the Pinner Gas Company, Limited, carrying £7 17s. 6d. per cent. dividend, fetched £7 10s. to £7 12s. 6d. each. A few fully-paid £10 ordinary shares in the Cape Town and District Gas Company (last dividend 7 per cent.) were sold for £5 apiece.

Shipley and the Public Lighting of Baildon.—When the Shipley Urban District Council met last week, Mr. C. B. Shaw (the Chairman of the Gas Committee) said he was surprised to see that at a recent meeting of the Baildon District Council complaint was made about irregularities in connection with the street lighting there, for which the Shipley Council were at present responsible. Before making such complaints at a public Council meeting, it might have been expected that an official complaint would have been lodged with the Clerk to the Shipley Council, or with the Gas Manager. The Chairman of the Council (Mr. John Pitts) said he thought the Baildon Council's action was neither courteous nor neighbourly. He did not contend that there had been no room for fault-finding in regard to the street lighting; but he did think in the first instance complaint might have been made to the department responsible for it. Mr. Hipkin asked if it were not a fact that the "antiquated apparatus" in the Baildon lamps was the cause of all the trouble. After some further discussion, the matter was allowed to drop.

Barnsley and Incandescent Gas Lighting.—In the "JOURNAL" last week (p. 370), we reported some remarks by Alderman Brady, in the Barnsley Town Council, which were rather adverse to the incandescent gas system for public lighting. The matter was referred to in a leading article in a local paper last Saturday. In the course of it the writer said: "Alderman Brady, as the Lighting Committee's official apologist, averred that Barnsley's experience of incandescent gas lighting has not been of a particularly encouraging character. Such a statement is the more remarkable because elsewhere this form of lighting is in high favour, and its success has long passed beyond the experimental stage. In many towns it is found that incandescent gas-lamps give a light superior to electricity—not that the illuminating power of gas is really greater, but the cost of electricity is so considerable that it is found advisable, for monetary reasons, to supply only a strictly limited volume of this light so far as the public lamps are concerned. True, Barnsley does not thus mar the effect of its street electric lighting. Nevertheless, it is a pity that in those streets where gas-lamps are retained, the best possible form of this illuminant—the incandescent light—is not used. There are manufactured gas-mantles capable of withstanding the vibration caused by ordinary street traffic, or even the violence of the wind, provided that the glass of the lamps be maintained intact. We hold no brief for gas or electricity. We simply desire to point out that so long as Barnsley continues to use gas as a street illuminant, it is to the public interest that this light should be used here, as elsewhere, under conditions which give results the most radiant. Non-incandescent gas lighting is now an anachronism. If a well-directed and intelligent trial be made of incandescent lighting, there is no possible reason why it should not be the success in Barnsley that this popular and economical system is in numerous other towns."

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Additional Inclined Retorts at the Salford Gas-Works.—The Salford Town Council at their meeting last Wednesday sanctioned the proposal by the Gas Committee to erect an additional bench of inclined retorts, having a capacity of 750,000 cubic feet of gas per 24 hours, with coke-conveyer, at their Albion Street works, at an estimated cost of £7800. The items are as follows: Excavating and concrete foundations, £120; basement floors, £170; all retorts, brick-work, and fire-clay material in the retort-bench, £3680; retort-fittings, valves, bracings, mains, and charging and discharging floors, £2780; coke-conveyor, gearing, and stanchions, £1050.

New Joint-Stock Companies.—The Simplex Gas-Engine Starter is the title of a Company which has been formed with a capital of £5000, in £1 shares, to acquire patents for starting gas-engines, &c. There will be no initial public issue. Under the title of the Coke-Ovens and Bye-Products Company, Limited, a Company has been formed, with a capital of £3000, in £50 shares, for the purpose indicated, and to adopt an agreement with M. Duchanoy, G. Bousquet, and M. Davicion, all of Paris, and to carry on the business of manufacturers of, and dealers in, coke-ovens, dealers in tar, oil, gas, and bye-products from coal, cannel, &c. There will be no initial public issue.

Lighting of Schools.—In the course of a report presented by the Education Committee at the meeting of the London County Council last Tuesday, they made the following remarks on the above subject: "We have for some time past considered the relative merits of the systems of gas and electric lighting in Council schools. Gas lighting by means of plain burners has been practically superseded in the Council's schools by the introduction of incandescent mantles, which have been found preferable from the points of view of economy and efficiency. Our principal endeavour has therefore been to obtain an accurate comparison of the merits of incandescent gas and electric lighting. As regards hygiene and general efficiency electricity possesses many advantages over gas; but, from exhaustive comparative tables which we have had before us, it would appear that the cost of maintenance is about 50 per cent. higher. We are informed, however, that the present type of incandescent electric lamp is likely to be superseded in the near future by metallic filament lamps, which will, it is anticipated, effect a very great saving in the consumption of current, and may even render electricity a cheaper illuminant than gas."

Exmouth Water Supply.—Spite of the urgency which is admitted to exist, it does not seem probable that anything will be done in the ensuing session for the improvement of the water supply of Exmouth. The Sanitary Committee were instructed to consult an expert with a view to the promotion of a Bill next session. They wrote to Mr. Hill, who was one of the Engineers acting for the Council in the arbitration with regard to the transfer of the works, and he replied that in the short time available he could not prepare a scheme for the next session; and the Committee thereupon decided not to undertake the responsibility of advising the Council to go to Parliament this year. At a special meeting of the Council at which this resolution came up, a long debate took place. It was proposed that Mr. R. G. Handsford Worth, Assoc.M.Inst.C.E., of Plymouth, should be asked to advise the Council in the matter. The suggestion was not adopted, nor was there any response to a proposal that the Surveyor to the Council should prepare a scheme. It was eventually decided to ask Mr. Hill to name the earliest day on which he could undertake the work. The effect of this is, of course, to put the matter off for another year.

Serious Gas Explosion in Dublin.—Last Saturday morning, damage which is estimated at some thousands of pounds was caused by an explosion of gas, followed by a fire at Messrs. Forrest's drapery establishment in Grafton Street, Dublin. The shop, which is one of the largest in the street, has also an entrance from Wicklow Street. In the kitchen below this entrance a servant girl, having lighted a fire, went to an adjoining apartment in which are some gas-cookers. The explosion immediately followed, and the girl was blown back into the kitchen. Her collar-bone was broken, and she was burned on the hands and body. The explosion practically wrecked the entire shop, and blew out all the windows and doors on the ground floor. When the Fire Brigade arrived, the place was in flames, and though the fire was extinguished within an hour, the stock was completely destroyed. Fortunately, the shop assistants, who were sleeping in the rooms overhead, escaped injury.

Claim for Damages in Connection with the Hoxton Suffocation Case.—At the Shoreditch County Court, yesterday, before his Honour Deputy-Judge Herbert Williams and a Jury, a claim was heard in which Charles Lawrence, his wife, and their infant daughter, of No. 2, Louisa Street, Hoxton, sued to recover £100 damages from the Gaslight and Coke Company for injuries caused by being poisoned through an escape from one of the Company's mains on the 23rd of May last. Evidence was given that a steam-roller had been at work the day before the occurrence, and at night an escape of gas was detected. In the morning the plaintiff, his wife, and two children were found to have been seriously affected, besides several persons next door, one of whom died. The Company denied liability on the ground that the Borough Council were liable for breaking the main with their steam-roller. After a lengthy hearing, the Jury decided against the Company, and awarded the plaintiffs £40 and costs. A report of the proceedings will appear next week.

The electric light failed at Merthyr Tydfil last Tuesday night, and the town was plunged in darkness for half-an-hour. The performance at the theatre was interrupted, and candles were used at the post office.

By inadvertence, the illustration in the second column of p. 330 last week was wrongly described. The apparatus shown was not Messrs. Arden Hill and Co.'s "Mars" gas-heated steam-radiator, but their automatic gas-heated low-pressure boiler.

At the Woking Police Station, a few days ago, a lad named Horace Vincent was charged by the collector for the Woking District Gas Company, Limited (Mr. G. E. Neale), with having broken open a meter and taken 2s. 6d. from it. He was sent to a reformatory school for five years.

At a meeting of the shareholders of the Oil-Gas Enrichment Company, Limited, held in Edinburgh last Friday, the resolution adopted at the meeting on the 15th ult. (*ante*, p. 274), that the Company be wound up, and that Mr. J. Gordon Mason, S.S.C., of Edinburgh, be appointed Liquidator, was confirmed.

The Directors of the Continental Union Gas Company, Limited, have decided to recommend, at the forthcoming general meeting, dividends for the past half year of 3½ per cent. on the ordinary stock, free of income-tax, and of a like amount on the preference stock, less income-tax; making 6½ per cent. in the former, and 7 per cent. in the latter case, for the year.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 409.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0
268,324	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Oct. 30	7	Bombay, Ltd.. . . .	6⅞—6¾*	..	5 3 8
40,000	5	,,	7	Do. New, £4 paid	4⅝—5*	..	5 12 0
50,000	10	Aug. 29	14	Bourne- 10 p.c. . .	27½—28½	..	4 18 3
51,810	10	,,	7	mouth Gas B 7 p.c. .	16½—16⅝	—½	4 3 7
53,200	10	,,	6	and Water Pref. 6 p.c.	14½—15½	..	3 17 5
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	245—250	—1	5 0 0
300,000	,,	,,	9¾	Do. New	185—190	..	5 0 0
50,000	,,	,,	5	Do. 5 p.c. Pref. .	115—120	..	4 3 4
206,250	,,	June 13	4	Do. 4 p.c. Deb. .	100—103	..	3 17 8
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	215—220	..	5 2 3
246,320	,,	,,	8½	Do. A. Ord. Stk. .	155—160	..	5 3 2
460,000	20	,,	10	British	40½—41½	..	4 16 5
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c. .	116—119	..	5 0 10
165,700	,,	,,	4½	Do. do. 3½ p.c. .	87—90	..	5 0 0
500,000	10	Oct. 11	7	Buenos Ayres (New) Ltd.	10½—11½	..	6 4 5
250,000	Stk.	June 27	4	Do. 4 p.c. Deb. .	92—94	—1	4 5 1
150,000	20	July 12	8½	Cagliari, Ltd.	26½—27½	..	6 0 0
100,000	10	—	—	Cape Town & Dis., Ltd.	6—8	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.. .	7—9	—½	5 0 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48—50*	..	6 0 0
103,000	Stk.	June 27	4½	Do. 4½ p.c. Deb. Stk.	94—96	..	4 13 9
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord. . .	106½—108½	..	4 12 2
1,443,280	Stk.	,, 29	5 5/16	Commercial 4 p.c Stk. .	100—105	..	4 19 0
560,000	,,	,,	5	Do. 3½ p.c. do. .	98—103	..	4 17 1
475,000	,,	June 13	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	6½	Continental Union, Ltd.	110—115	—2	5 13 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
460,170	Stk.	—	5½	Derby Con. Stk. . .	123—125	..	4 8 0
55,000	,,	—	4	Do. Deb. Stk. . . .	102—104	..	3 16 11
486,090	10	July 31	12	European, Ltd. . . .	22½—23½	..	5 2 2
354,060	10	,,	12	Do. £7 10s. paid	17½—18½	..	4 17 4
15,181,590	Stk.	Aug. 15	4 1/16	Gas- 4 p.c. Ord. . .	91—93	—2	4 14 7
2,600,000	,,	,,	3¾	light 3¾ p.c. max. .	86—88	..	3 19 7
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	103—107	—½	3 14 9
4,193,975	,,	June 13	3	Coke 3 p.c. Con. Deb.	81—83	..	3 12 3
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	93—98	..	5 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.	114—117	..	5 11 1
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	19—20	..	5 10 0
4,940,000	Stk.	May 15	8	Imperial Continental .	175—177	..	4 10 5
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	91—93	..	3 15 3
195,242	Stk.	Aug. 29	6	Lea Bridge Ord. 5 p.c. .	110—120	..	5 0 0
306,083	,,	June 27	4	L'rpool Unit'd Deb. Stk.	108—110	..	3 12 9
561,000	Stk.	Aug. 29	10	Liverpool United A . .	221—223	..	4 9 8
718,100	,,	,,	7	Do. B. .	160½—161½	..	4 6 8
152,736	Stk.	Feb. 14	7⅛	Maidstone 5 p.c. . .	142—147	..	5 3 8
75,000	5	June 27	5	Malta & Medn., Ltd. .	4—4⅛	..	5 11 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb..	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 30	3½	Monte Video, Ltd. . .	10½—11½	..	6 1 9
1,775,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	107—108	..	4 5 7
406,025	Stk.	June 27	3⅜	Do. 3½ p.c. Deb.	89—91	..	3 16 11
15,000	10	Aug. 29	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
55,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Apl. 26	8	Oriental, Ltd. . . .	140—145	..	5 10 4
60,000	5	Sept. 13	7	Ottoman, Ltd. . . .	6—6½	+⅛	5 7 8
398,490	5	Oct. 30	7	Primitiva Ord. . . .	6½—7*	..	5 0 0
796,980	5	July 31	5	Do. 5 p.c. Pref. .	4⅝—5⅛	—⅛	4 17 7
488,900	100	June 1	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
1,000,000	10	Oct. 11	8	River Plate Ord. . . .	12½—13	—⅛	6 3 1
312,650	Stk.	June 27	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
250,000	10	Sept. 27	8	San Paulo, Ltd. . . .	13—13⅜	..	5 18 6
125,000	50	July 1	5	Do. 5 p.c. Deb. .	48—50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	242—244	..	4 2 0
209,984	,,	,,	10	Do. B	242—244	..	4 2 0
523,500	,,	,,	10	Do. C	242—244	..	4 2 0
70,000	10	June 13	10	South African	15—16	..	6 5 0
6,429,895	Stk.	Aug. 15	5⅝	South Met., 4 p.c. Ord.	119—121	..	4 10 11
1,895,445	Stk.	July 12	3	Do. 3 p.c. Deb.	81—83	..	3 12 3
201,720	Stk.	Sept. 13	8	South Shields Con. Stk.	155—157	..	5 1 11
605,000	Stk.	Aug. 15	5⅛	S'th Suburb'n Ord. 5 p.c.	114—117	..	4 14 0
60,000	,,	,,	5	Do. 5 p.c. Pref. .	117—120	..	4 3 4
117,058	,,	July 12	5	Do. 5 p.c. Deb. Stk.	120—125	..	4 0 0
502,310	Stk.	May 15	5	Southampton Ord. . .	107—112	..	4 9 3
120,000	Stk.	Aug. 15	6¼	Tottenham A 5 p.c. .	120—123	..	5 9 9
398,940	,,	,,	5¼	and B 3½ p.c. .	100—103	..	5 1 11
149,470	,,	June 27	4	Edmonton 4 p.c. Deb.	99—101	..	3 19 3
182,380	10	June 13	8	Tuscan, Ltd.	10½—10¾	..	7 8 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102	..	4 18 0
193,742	Stk.	Aug. 29	5	Tynemouth 5 p.c. max.	107—109	..	4 11 9
30,000	Stk.	Feb. 14	8	Wands- A 5 p.c. . .	—	..	—
255,636	,,	Aug. 15	6½	worth B 3½ p.c. . .	128—133	..	4 17 9
75,000	,,	,,	5⅝	and C 3½ p.c. . .	—	..	—
80,075	,,	June 27	3	Putney 3 p.c. Deb. Stk.	77—80	..	3 15 0
845,872	,,	Aug. 15	5⅛	West Ham 5 p.c. Ord. .	102—105	..	4 17 7
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	118—120	..	4 3 4
228,300	,,	June 27	4	Do. 4 p.c. Deb. Stk.	101—104	..	3 1 11

Prices marked * are "Ex div."